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拼裝社群：十三行遺址墓葬空間與統計分析

Assembling Communities at Shihsanhang: A Mortuary Spatial and Statistical Investigation

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拼裝社群：十三行遺址墓葬空間與統計分析

Assembling Communities at Shihsanhang: A Mortuary Spatial and Statistical Investigation

本論文係張騫翮君（學號 R12125002）在國立臺灣大學人類學系完成之碩士學位論文，於民國 114 年 07 月 11 日承下列考試委員審查通過及口試及格，特此證明。

口試委員：_____（指導教授）

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If you visit the Center for Taiwanese Archaeology at Academia Sinica on a routine basis, you will inevitably notice the several cherry trees in front of the Fu Ssu-nien Library. When the scorching summer draws to a close, the foliage of the trees yellows and gradually falls away as Taipei's gloomy, rainy winter sets in. I would often pass them by on such winter days, holding my umbrella, recalling the bright and sunny spring days in which, upon the bare twigs, fresh pink blossoms would tremble in the mildly cool breeze, yet shone with life against a clear sky backdrop. Such recollections held the promise of the days to come, and when those days of blossoms finally arrived again this year, I found myself suddenly held in wonder: what would it feel like when, say, forty years from now, I would by chance come to see the trees again and recall the uncountable cycles of blossoming and shedding?

Indeed, an archaeology learner is particularly sensitive to the unfolding of time and events, and one can never foretell them with precision, just as one cannot uphold any definiteness throughout the past. Instead, one casts a retrospective gaze, and it seems as if the people I have met, the deeds I have done, and the things I have touched can be traced along a path of encounters, some vitally contributing to where I now stand along the route. I have witnessed six cycles of the cherry trees' blossoming, and I bear much gratitude for those who have thus contributed to my anthropological pathway.

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advice based on his deep understanding and keen perspectives on the archaeology of East Asia and Southeast Asia, as well as theoretical thoughts on archaeology in general. I am especially grateful for his diligent efforts in reviewing and commenting on the first draft of this thesis. Beyond the current thesis research, as the teaching assistant for his course, Chinese Archaeology, I learned how to mediate between the lecturer and the students, and the proper means to address various issues that happened to arise during this process. It was my pleasure and honor to work with and conduct research alongside him.

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In addition to my gratitude to the Center for Taiwanese Archaeology, IHP, which allowed me to access the data records from Shihsanhang, I am especially indebted to Tilley Kan (甘婕人), the administrator of the Center for Taiwanese Archaeology storeroom. Her thoughtful help and reminders during the data access application process guaranteed my ethical use of the mortuary data from Shihsanhang. I would also like to thank Research Assistant Cheng Ya-Yun (鄭雅勻) of the Shihsanhang project for providing me with all the spreadsheets containing the mortuary data. Her words of encouragement also spurred me on during the research process. Many thanks to Chuang Shih-Ying (莊詩盈), another research assistant on the Shihsanhang project, who consistently shared her thoughts on data processing and listened to me during the planning stage of this study. I am also indebted to Research Assistant Yang Chu-Ya (楊筑雅), Research Assistant Wu Jun-Wei (吳俊葦), and Postdoctoral Research Fellow Mélissa Cadet, all members of the AMR Lab, for taking the time to hear me out on some of my thoughts during research. Many thanks to the numerous contributors to the Shihsanhang project, whose contributions formed the cataloged record of the Shihsanhang remains.

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And Halfway Café (半路咖啡), where I spent most of the time designing and studying for the research, and where I drafted most of this thesis. I want to thank the members of this warm, cozy, and sometimes ridiculous (in a positive sense) place, Hsiao-Yu (小宇), Hsu Bao (徐飽), Yang Tzu-Hsuan (楊子瑄), Ku Fang-Yi (谷芳逸), Lee Tzu-Hao (李子豪), Tsao Yu-Jun (曹語均), and Bo-Shao (柏邵), among many others. Their occasional talk, uplifting words, and shared dinners spurred me to write on. I will miss our memorable moments together in the upcoming years abroad.

I thank my partner Wang I-Neng (王怡能), who accompanied me through frustrating moments of this research. I also want to apologize for not being available to you when needed, due to the time constraints of my research. I am also grateful to my parents, who provided me with emotional support while drafting this thesis. Lastly, sorrow and gratitude are given to my grandparents, Chang Ching-Hai (張清海) and Shen Yu-Chu (沈玉珠), who passed away during my graduate training. In dreams, I saw them taking me through their rice paddy fields at my old home in Xiushui (秀水), Changhua (彰化). It was always when I said, “I’m so agonized by your death. I miss you so much,” that I awakened from my sleep, with eyes wet with tears. This thesis is dedicated to their humble but quietly devoted lives.

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中文摘要

十三行遺址（ca. 1800-550 cal. B.P.）位於淡水河河口，該遺址因出土目前台灣已知最早的煉鐵證據，使之成為台灣金屬器時代（ca. 2400-450 B.P.）最為重要的聚落遺址之一。過去針對十三行遺址之研究，多半著重該聚落遺址作為一社會體系（social system）的形貌、參與煉鐵技術之社會單位，以及出土玻璃珠所指向之海上交換網絡等等。筆者奠基於以上研究，乃嘗試從「拼裝」（assemblage）的概念出發，並結合考古學中之於社群（community）的討論，針對十三行出土墓葬進行空間與統計分析。具體而言，本文藉由相對定年並佐以絕對定年資料，首先將十行墓葬劃分為三個時期，緊接著運用 GIS 軟體與 R 語言，針對三時期之墓葬各自以 Average Nearest Neighbor、Buffering、Global Moran's I、Spearman 相關係數（Spearman's correlation coefficient）與叢集分析（cluster analysis）等工具分析之。筆者進而能夠擬測墓葬空間叢集之規模，並於時間之縱深與空間之橫展中，探討陪葬品之數量與種類、死者年齡、性別與病理特徵之間的相關性與差異。根據分析結果，第一期（ca. 1800-1400 cal. B.P.）的社群規模較小且維繫較為鬆散；第二期（ca. 1400-1050 cal. B.P.）則可觀察到社群數量之劇增，筆者更發現，那些含有民族誌中所記載具特殊社會意義之物品（即青銅刀柄、陶容器、大量玻璃珠等）的墓葬，分散在不同社群中，顯示出相較前一期更為劇烈與多元的社群領域化（territorialization）過程；到了第三期（ca. 1050-550 cal. BP.），各社群乃透過縮短墓葬間距來實踐與維繫內部凝聚力，而筆者認為，此與陪葬品之數量大幅下降有關。筆者進一步懷疑，第一期至第二期的葬俗變化實與煉鐵技術之引入有關；至於第二期至第三期的轉變則可歸因於，十三行人原先所參與的東南亞海上交換

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網絡，逐漸受到漢人影響。總體而言，筆者定調比起「體系」，「拼裝」一詞應能更精確地描述十三行人所身處的社會——蓋因十三行並非一依循功能機制運作的單一體系，而是由多個異質的社群所匯聚而成，並拼裝成一具特定認同與內部凝聚力的動態整體。

關鍵字：十三行、墓葬、assemblage theory、GIS、統計分析、社群

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ABSTRACT

The Shihsanhang (ca. 1800-550 cal. B.P.) site, located along the Tamsui River estuary in Taipei, northern Taiwan, is one of the most significant Metal Age (ca. 2400-450 B.P.) settlement sites in Taiwanese archaeology. As the oldest site known to yield remains of *in situ* iron production in Taiwan, past research on Shihsanhang has focused on how the settlement functioned as a social system, the social units that carried out ferrous metallurgical techniques, and the maritime exchange networks to which the abundance of glass beads unearthed at the site points. While grounding my study in these discussions, in this thesis, I attempt to theoretically employ a new approach drawn from the anthropological concept of the "assemblage" (which differs from the traditional archaeological term of assemblage), coupled with archaeological theorizations of community, in the spatial and statistical analyses of the mortuary remains at Shihsanhang. This usage of "assemblage" draws primarily from Delanda, Latour, and Bennet's discussions. After dividing the mortuary remains into three chronological phases, I utilize the Average Nearest Neighbor, Buffering, Global Moran's I, Spearman's correlation coefficient, and cluster analysis tools with GIS software and the R coding language, to delineate spatial clusters of graves and detect correlations and differences among the quantity and quality of grave goods, age, sex, and pathological traits. According to the analytical results, in Phase 1 (ca. 1800-1400 cal. B.P.), communities were comparatively small and loosely maintained. In Phase 2 (ca. 1400-1050 cal. B.P.), I observe an increase in the number of communities, as well as the sporadic distribution of bronze knife handles, pottery, and relatively large quantities of glass beads, indicating intensified but varied community territorialization processes. Finally, in Phase 3 (ca. 1050-550 cal. B.P.), the amount of all the mentioned grave goods decreases, and communities respond to this material decline by burying their dead at shorter spatial intervals to maintain the internal

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cohesion of communities. I attribute the changes in mortuary practices between Phase 1 and Phase 2 to the introduction of iron production, and attribute the shifts in mortuary practices from Phase 2 to Phase 3 to the Shihsanhang residents' transition from Southeast Asian exchange networks to those linked with the Han-Chinese. Based on these results, I propose that "assemblage" more accurately characterizes Shihsanhang than "system." This is because, rather than one systematic social entity operating according to functional mechanisms, Shihsanhang appears to be assembled, that is, to be gathered from many heterogeneous communities into a dynamic compound involving an identity and internal cohesiveness.

Keywords: Shihsanhang, mortuary, assemblage theory, GIS, statistical analysis, community

doi:10.6342/NTU202502709

TABLE OF CONTENTS

ACKNOWLEDGEMENTS i

中文摘要 v

ABSTRACT vii

TABLE OF CONTENTS ix

LIST OF FIGURES xii

LIST OF TABLES xvi

CHAPTER 1: INTRODUCTION 1

CHAPTER 2: BACKGROUND OF THE SHIHSANHANG SITE 7

CHAPTER 3: THE RESEARCH MATERIALS: THE SHIHSANHANG BURIALS 10

CHAPTER 4: PAST RESEARCH ON SHIHSANHANG 12

4.1 The First Problem: The Lack of Intra-Settlement Chronological Control ... 16

4.2 The Second Problem: The Social as a Systematic and Functional Whole 17

4.3 The Third Problem: The Settlement as a Self-Evident Social Unit or Passive Reflection of Social Organization 20

4.4 The Fourth Problem: Anthropocentrism 22

4.5 Section Summary 23

CHAPTER 5: THE RESEARCH QUESTIONS 25

CHAPTER 6: THEORETICAL BACKGROUND 31

doi:10.6342/NTU202502709

6.1. Assemblage Theory 31

6.2. Assemblage and Community 41

6.3. Exploring Communities through Burials 44

6.4. Section Summary 51

CHAPTER 7: THE SHIHSANHANG MORTUARY DATA AND DATA PROCESSING METHODS EMPLOYED 53

7.1. The Available Data Records 53

7.2. Processing the Data Records 56

7.2.1. Associating the Grave Goods Incident Data with Specific Burials 56

7.2.2. Chronological Control 57

7.2.3. Creating the Feature Points of Skeletons on the GIS Software 61

7.3. The Final Dataset for Analysis 61

7.4. Section Summary 61

CHAPTER 8: THE RESEARCH METHODS 63

8.1 Spatial Analysis 63

8.1.1. Average Nearest Neighbor (ANN) 63

8.1.2. Buffering 65

8.1.3. Global Moran's I (GMI) 66

8.2 Statistical Analysis 67

8.2.1. Spearman's Correlation (SC) Coefficient 67

8.2.2. Cluster Analysis (CA) 68

8.3. Section Summary 70

CHAPTER 9: THE ANALYTICAL RESULTS 71

9.1. The Average Nearest Neighbor (ANN) Analytical Results 73

9.2. Buffering Results 73

9.3. The Global Moran's I (GMI) Analytical Results 76

doi:10.6342/NTU202502709

9.4. Spearman's Correlation (SC) Matrices 77

9.5. The Cluster Analysis (CA) Analytical Results 79

9.6. Section Summary 82

CHAPTER 10: DISCUSSION 84

10.1. From Assemblage Theory to Shihsanhang 85

10.2. Phase 1 95

10.3. Phase 2 99

10.4. Phase 3 105

10.5. What Triggered the Changes? 108

10.6. Section Summary 110

CHAPTER 11: CONCLUSION 113

REFERENCES 125

FIGURE CAPTIONS 144

TABLE CAPTIONS 180

APPENDIX 1 182

A.1. The Codes for Calculating Spearman's Correlation Coefficients 182

A.2. The Codes for Cluster Analysis 183

doi:10.6342/NTU202502709

LIST OF FIGURES

Figure 1. Shihsanhang grave goods. a) Pottery vase from grave HM001 (Cataloguing Number: T0030043) (臧振華 and 劉益昌 n.d.-a); b) Carnelian beads from grave BM062 (Cataloguing Number: T0030945) (臧振華 and 劉益昌 n.d.-b); c) Glass beads from grave HM004 (Cataloguing Number: T0030969) (臧振華 and 劉益昌 n.d.-b); d) Bronze knife handle from grave HM019 (Cataloguing Number: T0030259) (臧振華 and 劉益昌 n.d.-c). Image cited from the Open Museum (https://openmuseum.tw/)..... 144

Figure 2. Map of the Shihsanhang site created by the author. Color base map retrieved from Center for GIS, RCHSS, Academia Sinica(中央研究院人社中心地理資訊科學研究專題中心 n.d.). Outline inset provided by Professor Wu Mu-Chun, Department of Anthropology, National Taiwan University. 145

Figure 3. Map of all the excavation sectors of the Shihsanhang site, with Sector B, C, and H marked red. Image created by the author using QGIS with data from the Institute of History and Philology, Academia Sinica, Taiwan. 146

Figure 4. Plan showing the division and labeling of a typical excavation unit of the 1990-1992 salvage excavations of Shihsanhang. Image created by the author. 147

Figure 5. The TP employed system at Shihsanhang. Image created by the author. 147

Figure 6. Distribution map of the graves analyzed in this study. Image created by the author. 148

Figure 7. A flow diagram illustrating Colin Renfrew's (2011[1972]) six social sub-systems – the craft (technological), social, projective (symbolic), communicative (trade), subsistence, and metallurgical subsystems. Image from the same book. 149

Figure 8. A Harris Matrix showing the formation process of a burial. Image cited from Harris (2014a:140, Figure 58) 149

Figure 9. Map of the sources of the C14 samples. Image created by the author. 150

Figure 10. Distribution map of the graves from Phase 1 (N=25). Image created by the author. 151

Figure 11. Distribution map of the graves from Phase 2 (N=156). Image created by the author. 152

doi:10.6342/NTU202502709

Figure 12. Distribution map of the graves from Phase 3 (N=75). Image created by the author. 153

Figure 13. Map of the grave clusters from Phase 1. Image created by the author..... 154

Figure 14. Map of the grave clusters from Phase 2. Image created by the author..... 155

Figure 15. Map of the grave clusters from Phase 3. Image created by the author..... 156

Figure 16. Map of the distribution of skeleton posture during Phase 1. Image created by the author. 157

Figure 17. Map of the distribution of skeleton posture during Phase 2. Image created by the author. 158

Figure 18. Map of the distribution of skeleton posture during Phase 3. Image created by the author. 159

Figure 19. Map of the distribution of the orientation of the heads during Phase 1. Image created by the author. 160

Figure 20. Map of the distribution of the orientation of the heads during Phase 2. Image created by the author. 161

Figure 21. Map of the distribution of the orientation of the heads during Phase 3. Image created by the author. 162

Figure 22. Map of the distribution of the skeletal sexual characteristics from Phase 1. Image created by the author. 163

Figure 23. Map of the distribution of the skeletal sexual characteristics from Phase 2. Image created by the author. 164

Figure 24. Map of the distribution of the skeletal sexual characteristics from Phase 3. Image created by the author. 165

Figure 25. Map of the distribution of the skeletal ages from Phase 1. Image created by the author. 166

doi:10.6342/NTU202502709

Figure 26. Map of the distribution of the skeletal ages from Phase 2. Image created by the author. 167

Figure 27. Map of the distribution of the skeletal ages from Phase 3. Image created by the author. 168

Figure 28. Plot of the within-cluster sum of squares for varying values of k in Phase 1. The elbow point (the optimal number of clusters) is observed at k = 3. Image created by the author. 169

Figure 29. The grave goods clustering dendrogram of Phase 1 (N=25) as determined by cluster analysis. The labeled red boxes (C1 (n=3), C2 (n=2), and C3 (n=20)) illustrate the clusters identified based on the elbow point (the optimal number of clusters). Image created by the author. 169

Figure 30. Map of the distribution of the graves belonging to different clusters (C1 (n=3), C2 (n=2), and C3 (n=20)) identified via cluster analysis in Phase 1. Image created by the author. 170

Figure 31. Plot of the within-cluster sum of squares for varying values of k in Phase 2. The elbow point (the optimal number of clusters) is observed at k = 3. Image created by the author. 171

Figure 32. The grave goods clustering dendrogram of Phase 2 (N=156) as determined by cluster analysis. The labeled red boxes (C1 (n=56), C2 (n=6), and C3 (n=94)) illustrate the clusters identified based on the elbow point (the optimal number of clusters). Image created by the author. 172

Figure 33. Map of the distribution of the graves belonging to different clusters (C1 (n=56), C2 (n=6), and C3 (n=94)) identified via cluster analysis in Phase 2, with statistical exceptions labelled only. Image created by the author. 173

Figure 34. Map of the distribution of the graves belonging to different clusters (C1 (n=56), C2 (n=6), and C3 (n=94)) identified via cluster analysis in Phase 2, with the name of each grave labelled. Image created by the author. 174

Figure 35. Plot of the within-cluster sum of squares for varying values of k in Phase 3. The elbow point (the optimal number of clusters) is observed at k = 2. Image created by the author. 175

Figure 36. The grave goods clustering dendrogram of Phase 3 (N=75) as determined by cluster analysis. The labeled red boxes (C1 (n=1) and C2 (n=74)) illustrate the clusters

doi:10.6342/NTU202502709

identified based on the elbow point (the optimal number of clusters). Image created by the author. 176

Figure 37. Map of the distribution of the graves belonging to different clusters (C1 (n=1) and C2 (n=74)) identified via cluster analysis in Phase 3, with the graves containing pottery labeled only. Image created by the author. 177

Figure 38. Map of the distribution of the graves belonging to different clusters (C1 (n=1) and C2 (n=74)) identified via cluster analysis in Phase 3, with the name of each grave labeled. Image created by the author. 178

Figure 39. Map of the distribution of glass beads in Phase 2, with burials containing over 520 beads labeled. Image created by the author. 179

doi:10.6342/NTU202502709

LIST OF TABLES

Table 1. The C14 determinations used in this research, with "SCL" standing for the "Shihsanhang Culture Layer." The calibration of the Libby dates was performed by Professor Wang Kuan-Wen with Oxcal v4.4.4 (Bronk Ramsey 2021), r.5, and the IntCal20 calibration curve (Reimer et al. 2020). 180

Table 2. The Average Nearest Neighbor (ANN) analytical results of the graves from each phase. 180

Table 3. The percentages and counts of within-cluster and outlier graves from each phase. 181

Table 4. The Global Moran's I (GMI) analytical result of the skeletal sexual characteristics from each phase. 181

Table 5. The Global Moran's I (GMI) analytical result of the ages from each phase.. 181

Table 6. Spearman's correlation and p-value matrices of each phase. (https://docs.google.com/spreadsheets/d/e/2PACX-1vSM77XzgTthiFKgF1MdFqMLJmagI59M_WihDbu8-phY1CaQarHguraSgCgxH7MHf5NW2lIFji9FhJjO/pubhtml) 181

Table 7. Characteristics of each cluster identified by cluster analysis (CA) from Phase 1. 181

Table 8. Characteristics of each cluster identified by cluster analysis (CA) from Phase 2. 181

Table 9. Characteristics of each cluster identified by cluster analysis (CA) from Phase 3. 181

doi:10.6342/NTU202502709

CHAPTER 1: INTRODUCTION

Picture what it would have been like to lose a close relative – say, Grandmother – one millennium ago in Metal Age Northern Taiwan (ca. 2400-450 B.P., after 劉益昌 (2019)). Surrounded by her children and grandchildren, Grandmother passed away in her bed on a humid, sub-tropical morning. She had been ill for several days, and the best shaman's spirit-fending rite[1] had proven in vain. Grieving, you climb down the family wooden stilt house[2] and stand motionless, letting your mind wander across the landscape that you knew better than any other: facing west, you would see the beach and the sleepy blue ocean, which, a thousand years later, would be named the Taiwan Strait; to the north, between lush patches of trees and grassland, you caught the glimmers of an ever-flowing river's estuary, flanked by a squat peak to the east of the village and other mountains looming beyond its waters. In years yet to come, the river would be called the Tamsui (淡水), and the peak Guanyin (觀音山). The settlement would eventually be known as

[1] I am making analogy to the spirit-fending rites ethnohistorically recorded to have been conducted by the Tamsui Aborigines, whom archaeologists believe were the cultural descendants of the Shihsanhang residents. In a report allegedly written by Jesuit Father Jacinto Esquivel in 1633 and titled *Memoria de lo perteneciente al estado de la nueva conversion de la Isla Hermosa* (Borao Mateo 2001:180), Aboriginal "sorceress" were said to perform curing rites, during which

> [t]hey do not use herbs, neither medicines nor venom, which they are ignorant about. Rather, their cures consist in sucking the body of the sick, and to lie prostrate on the ground covered by a blanket, spitting on a plate of cooked rice while saying prayers in a "Greek-sounding language." Afterwards, they remove the *chicubises* (sic; glass and carnelian beads) from the sick person, making him kiss them. They put a big knife under his head, and order that the sick should eat nothing for three days.

Sickness was believed to result from attacks from evil *aberroa*, or, spirits, and such rites were aimed at fending off these beings.

[2] Ethnohistorically, the Tamsui Aborigines were recorded to live in stilt houses due to the humidity of the environment. In *Fan Su Liu Kao* (番俗六考, or the *Six Studies of the Savage Customs*), written by the Imperial High Commissioner of the Qing Empire Huang Shu-Jing (黃叔儆 2021[1722]), it says that

> the soil in the Tamsui region is humid. Thus, the savages' rooms are constructed by binding twitch-grass, building ladders to enter, and paving wooden boards as floors. The savages also use wooden boards to construct houses, which are like inverted boats and extremely cramped. These houses are not as spacious as those in the villages near the yamen of the county. The front and back doors look the same (translation mine).
>
> 澹水地潮濕，番人作室，結草構成，為梯以入，鋪木板於地；亦用木板為屋，如覆舟，極狹隘，不似近府縣各社寬廣。前後門戶式相類。

Here, by analogy, I tie these later customs to the Shihsanhang residents.

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Shihsanhang (十三行), and the archaeological settlement site now dated to ca. 1800-550 cal. B.P. (after 陳光祖 et al. 2019).

In the gentle hush of the waves, memories of Grandmother collecting shellfish and trading with canoe-rowing visitors from other villages would flash through your mind. That is when you would hear that Grandmother's ceramic jar containing glass bracelets, along with the family's most precious heirloom – a bead vest, would be buried with her. By exporting well-forged iron blades,[3] Grandmother, who had excelled in exchange, obtained the beads in strands and sewed them one by one with care onto the vest with older beads attained generations ago. Through the dim doorway, as your aunts and uncles unfolded the garment, you would see thousands of beads shining in colors of cobalt blue, orange, and yellow, while Grandmother's limbs had already been flexed in preparation for burial. Your cousin would be busy digging a grave next to the stilt house,[4] but also remaining careful enough not to disturb other ancestors' burials. Soon, Grandmother would join the many generations who dwelled forever near the stilt house after death…

When I was first introduced to the remains of the Shihsanhang settlement site as a freshman, I was, like several of the site's excavators in the last century (Liu 1963; 楊君

[3] Shihsanhang yields the earliest known *in situ* iron production features across Taiwan (Tsang 2010).
[4] Both Fr. Jacinto Esquivel (Borao Mateo 2001:180) and Huang (2021[1722]) recorded this custom of the Tamsui Aborigines. *Memoria de lo perteneciente al estado de la nueva conversion de la Isla Hermosa* reads

> [t]he dead is buried beneath the houses or in some nearby area. They put palm mats inside the tomb so that the body would not get wet, and they place some rice porridge beside the head for its food. They bury the dead in a knee bent position in very small holes in the ground. On top of the burial place[s] they leave the quiver and arrows, clay jars, stones, and other precious belongings of the deceased.

While Huang saw that

> When a savage dies, timbers are used to make a coffin, and the body is buried next to the household. Objects that used to be used often by the dead is hung in front of the tomb (translation mine).
>
> 番亡，用枋為棺，瘞於厝邊，以常時什物懸墓前。

Although I analogize these customs to the Shihsanhang residents, archaeologically speaking, there is no evidence supporting the latter's leaving artifacts on top of graves. Instead, grave goods were buried with the deceased.

doi:10.6342/NTU202502709

實 1961; 臧振華 and 劉益昌 2001), astounded and intrigued by its dazzling variety of grave goods. There were pottery jars and vases (Figure 1a), of differing sizes and diverse forms, adorned with sophisticated geometrical patterns. More than 10,000 glass and carnelian beads (Figure 1b and Figure 1c) displayed their vibrant colors in varied groups, sequences, and forms, shimmering in shifting angles of light, and one of the few intricately-casted anthropomorphic bronze knife handles (Figure 1d), eyes wide open, bore a lasting grin that coaxed its examiner to delve into their sociocultural meanings, both stylistically and in their burial contexts. But most striking of all were the field notes and photos showing these artifacts placed close to the flexed skeletons of the Shihsanhang residents themselves, the people with whom these artifacts were intertwined, the subjects of archaeologists' analytical vision.

This astonishment and curiosity has remained fresh ever since, and in the following years of my anthropological training, I found an accumulation of studies related to Shihsanhang's cultural chronology (Chang 1969; Liu 1963; 劉益昌 2002), social lives (Tsang 2010[2002]), maritime trade (Wang 2016; 劉益昌 2019), ferrous metallurgical techniques (Chen 2000), and pathologies (楊宗儒 2023). While I applaud the pathbreaking contributions of these investigations, reading them through a critical lens, I identified fields that past research has cleared but that have yet to be cultivated.

Most of the research on Shihsanhang, given the many limitations in the data records yielded from 1990 to 1992, was devoid of fine-grained, intra-settlement chronological control or spatial analysis. In addition, several of the studies took Shihsanhang as a functional, unchanging, systematic, anthropocentric, or self-evident social unit. However, many scholars (Bennett 2010; DeLanda 2006, 2016; Harris 2013, 2014b; Ingold 1993; Latour 1992, 2005; Pauketat 2001, 2008; Sahlins 2022; Shanks and Tilley 1987; Tsing

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2015) within and beyond anthropology over the last decades have questioned such an ontological stance of the social, while others have ceased seeing settlements as self-evident social units (Ashmore 2002; Birch 2014b; Canuto and Yaeger 2000a; Düring 2007).[5]

I was thus prompted to wonder: With regard to the above-mentioned literature, how did the Shihsanhang residents, both human and non-human, interrelate with each other? If a settlement site such as Shihsanhang should not be taken as a self-evident social unit in itself, what kind of social entities larger than each individual member should we reconstruct Shihsanhang as accommodating? What was put into practice to "assemble" these social entities, and what were their relations? Last but not least, how can I address these questions by investigating the people and things related to death – graves, burial goods, the deceased, and the living (mourners), etc., at Shihsanhang?

As an attempt to address these issues, in this thesis, primarily following DeLanda (2006, 2016) and others (Bennett 2010; Latour 2005; Tsing 2015), I theoretically treat the social as "assemblages" rather than "systems." I then connect the concept of assemblage to archaeological theorizations of "community" (Birch 2014a; Canuto and Yaeger 2000a; Düring 2007, 2013; Harris 2013, 2014b; Pauketat 2008). As for methodological design, I conduct spatial and statistical analyses of 256 graves and their burial goods with the assistance of Geographical Information System (GIS) software – ArcGIS Pro and QGIS – and R Studio. This involves identifying clusters and outliers in terms of spatial distribution, posture, and the quality and quantity of grave goods among the 256 burials. Chronological control is achieved through relative dating methods and verified by C14

[5] I discuss the cited reference synthetically in the "Past Research on Shihsanhang" and "Theoretical Background" sections.

doi:10.6342/NTU202502709

determinations conducted during the early 21st century (臧振華 and 劉益昌 2001). A three-phase chronology derived from this control provides the framework for the analyses as a whole. Additionally, the interpretation of the analytical results is assisted by ethnohistorical and ethnographic texts.

The concept of "assemblage" here does not align with its traditional definition in archaeology, i.e., "[a] group of artifacts recurring together at a particular time and place, and representing the sum of human activities" (Renfrew and Bahn 2016:576) . Instead, tracing the footprints of several scholars (Bennett 2010; DeLanda 2006, 2016; Deleuze and Guattari 1987; Tsing 2015), I define an assemblage, or, more accurately, an assembling process, as the marshalling of different-natured components (both human and non-human) through historical processes into a working compound that acquires an identity and internal cohesiveness from the interactions between these components. This acquisition process of identity and internal cohesiveness is termed *territorialization*, in which humans and non-humans are related to each other by releasing *capacities* stemming from their properties during encounters with one another (DeLanda 2006, 2016). Under this meaning of assemblages, rather than the linear causality and cybernetic predictability implied in functions and systems, heterogeneity and precarity are at play (DeLanda 2006; Tsing 2015). The meaning of "community" then can be grounded in this definition: I take a community as a particular assemblage that works at a "specific [scale of spatiality and practice] and that always involves [multiple] human beings" (Harris 2014b). "Settlement" merely describes the physical co-residence of a group of people and things, while "community" emphasizes the non-physical and constructive nature of social affiliation involving both humans and non-humans, as underscored in the concept of assemblage (following DeLanda 2006, 2016; Canuto and Yaeger 2000a; Harris 2014b). I will introduce these ideas in detail in the "Theoretical Background" section.

doi:10.6342/NTU202502709

Basing my approach on the ideas of assemblage and community, the ultimate goal of this thesis is to answer these questions: How was Shihsanhang assembled by multiple communities? How were these communities assembled by individual human and non-human members? And how were the assembling processes engendered through history and precarity? Nourished by but departing from past research, I answer these questions by accessing Shihsanhang's mortuary data records in cataloged excavation forms and analyzing them through computer-based means, thanks to the efforts of many others. By exploring aspects central to Shihsanhang's world[6] but left untouched by past research, it is my meager hope that I may approach lives at Shihsanhang more closely and vividly, despite time's erasing capacity.

But before I make the approach, let me first set the backdrop for what follows.

[6] By "world," I refer to the concept of "worlding" or "world-making" as proposed by Anna Tsing (2015). World-making refers to the "practical activities of making life," or forms of living, which are not limited to human actors. Building on Viveiros de Castro (1998), Tsing suggests different people and species have distinct worlds, and "world-making" focuses on "practical activities…nonhuman beings might contribute their own perspectives" (Tsing 2015:292). For example, a beaver's world-making activity is to build a dam out of tree cutting and piling branches in the water. A tick's world-making activity is to raise its fore legs outward, stay motionless, and sense for temperature change in the air caused by a walking-by animal (Ingold 2021). I believe the Shihsanhang residents have their own world-making, and this thesis is an attempt to think about it.

doi:10.6342/NTU202502709

CHAPTER 2: BACKGROUND OF THE SHIHSANHANG SITE

To give a more "scientific" introduction, the Shihsanhang settlement site is buried in the dunes on the southern bank of the Tamsui River estuary (25°09'31.4"N 121°24'25.1" E), the western opening of the Taipei Basin in northern Taiwan (Figure 2). The site is framed by the Taiwan Strait to its west and the Bali Guanyin Mountain to its east, while the Tamsui River joins the sea in the north. To its south is a narrow plain that extends toward the Linkou Terrace. Situated at a geographical crossroads, the settlement enjoyed easy transportation. By water or by land, people could traverse deep into the Taipei Basin or venture toward the open sea. Needless to say, the settlement was also gifted with ready access to a variety of ecotones between beach, mangrove forests, saltwater and freshwater wetlands, grasslands, and mountainous forests, etc. The ease of transportation and immediate availability to ecotones of the settlement are evidenced by the diverse biological remains and foreign goods (Tsang 2010[2002]) yielded from the site.

Shihsanhang was discovered in 1955, and it largely remained untouched except for some small-scale academic excavations (Chang 1969; Liu 1963; 楊君實 1961) until 1989, when the site came under the engulfing threat from the construction of the Bali Sewage Treatment Plant. To save the precious archaeological remains, Tsang Cheng-hwa, Jeff Y. T. Kao, and Liu Yi-Chang from the Institute of History and Philology (IHP), Academia Sinica, Taiwan, conducted five rescue projects from June 1990 to August 1992. These projects salvaged over 7,000 square meters of the site in total, and yielded a massive amount of archaeological remains, including over 9,000 kg of lithic and ceramic artifacts, 30,473 glass beads, 294 burials, and others (Tsang 2010[2002]; 陳光祖, et al. 2023a). The excavations also revealed the first evidence of *in situ* ferrous metallurgical activities in

doi:10.6342/NTU202502709

Taiwan, including a huge bulk of iron slags, several confirmed or suspected bloomery furnaces, and other iron-working features.

The rescue projects divided the site into eight sectors, labeled from A to H (Figure 3). Among them, Sectors A, B, C, D, E, and H preserved the largest amount of archaeological remains, indicating that these sectors as a whole had been the Shihsanhang residents' core activity area. In contrast, only a small number of relics were discovered in Sectors F and G. A recent investigation (陳光祖, et al. 2019), corroborated by radiocarbon dating results, suggests that Sectors B, C, and D have the earliest inhabitation history, which dates from ca. 1800 to 1500 cal. B.P. The intensity of human activities in Shihsanhang climaxes during ca. 1500-1000 cal. B.P., as residents gradually expanded into Sectors A, E, and H, with Sectors B, C, and D remaining occupied. Between approximately 650 to 500 cal. B.P., the site remained inhabited, but the occupation area had decreased in size, limited to Sector H and probably also B.

Each excavation unit was 4 m by 4 m (Figure 4), coded by the "TP system" (Figure 5), and each TP unit was divided into four 2 m by 2 m sub-units labeled with capital Roman letters (A, B, C, and D). Each sub-unit was further segregated into four 1m by 1m sub-sub-units, which were coded with lowercase Roman letters (a, b, c, and d). Balks of 1 m were left unexcavated between the units for observations of profiles. However, if a balk happened to cut through a feature, the balk would be dug, and such an "extension" of a standard unit was labeled as "ex," with the direction of extension added before, i.e., "Nex," "Sex," "Eex," and "Wex." The salvage projects used spits (arbitrary levels) of 10cm thickness. However, natural layer excavation methods were occasionally applied to features such as postholes and refuse pits (陳光祖, et al. 2019).

doi:10.6342/NTU202502709

The site's stratigraphy consists of four gross layers: the Topsoil, the Modern Han-Chinese Culture Layer (dating approximately to the Qing Colonial Era and later), the Shihsanhang Culture Layer, and the Basal Layer. The Basal Layer includes the Sterile and a Seepage Layer on top of it, the latter formed by the downward seeping of organic materials and various fragmented remains from the Shihsanhang Culture Layer (陳光祖, et al. 2019). In this study, I focus solely on the remains from the Shihsanhang Culture Layer.

doi:10.6342/NTU202502709

CHAPTER 3: THE RESEARCH MATERIALS: THE SHIHSANHANG BURIALS

All of the mortuary data records analyzed in this research come from the "Cataloguing, Research and Publishing of Archaeological Data, and Reconstructing the Story of the Ancient People at the Shihsanhang Site" (國定十三行考古遺址出土資料整理研究出版暨先民歷史再現計畫) project, directed by Professor Chen Kwang-tzuu from the IHP. This project is currently cataloging the relics from the 1990-1992 salvage excavations. As a participant in this project since 2019, the director has granted me access to all mortuary data records.

The graves are coded with the "M" system, with "M" standing for "Mortuary." The code of the excavation sector is added before the "M," which is followed by three digits to denote an individual grave. Among the 294 burials, the majority are primary inhumations containing a single individual in a flexed position with head oriented to the southwest and facing northwest or southeast. However, there are also 5 triple burials and 24 double burials. 172 of the burials yielded grave goods in varying amounts. The grave goods are primarily comprised of ceramic jars or vases, glass or carnelian beads, glass bracelets or earrings, gold foil objects, copper items, and animal bones and teeth, etc.

In addition, the Shihsanhang residents often dug the graves in close proximity to other features related to daily life, such as postholes, shell middens, hearths, iron-working features, and refuse pits. Burials were usually unearthed below or adjacent to pits or thick deposits of potsherds (陳光祖, et al. 2020). There is also clear evidence of burials cutting into other features, and vice versa, across the excavation sectors (陳光祖, et al. 2020; 陳光祖, et al. 2023b). Elsewhere, I confirm the contemporaneity of the graves and these

doi:10.6342/NTU202502709

features in Sector H (Zhang 2023). Thus, it seems fair to consider the burials as residential, particularly based on the work of Carter (2023), who finds similar examples in Southeast Asia. By "residential", I mean they occupy locales "where everyday domestic activities occur and where a clear spatial relationship between the living area and the domestic structure exists" (Adams and King 2010).

I initially selected 271 graves for this research. They are scattered in Sectors B, C, and H, which respectively contain 91, 54, and 126 burials (Figure 6). I selected these three sectors because 11 skeletal or charcoal samples from them were sent for C14 determinations (Table 1), which are crucial for verifying the chronological sequences of the burials. In contrast, none of the 54 burials from Sector E, nor the 5 graves from Sector C, were dated, engendering their exclusion from my research. The process of confirmation of the included burials' temporal sequences is explained in "The Available Data and Data Processing" section. Here, it suffices to say that, after further removing burials without any temporal information, 256 graves eventually undergo analysis.

doi:10.6342/NTU202502709

CHAPTER 4: PAST RESEARCH ON SHIHSANHANG

Now that the backdrop is set, I turn to the past research that has provided the invaluable nourishment without which this study could not have taken shape. To be clear, this section does not offer a full inventory of every publication about Shihsanhang. Rather, I concentrate on those in which this thesis research is most closely grounded and to highlight the areas that remain under-explored in Shihsanhang research.

Discussions on the discovery and initial excavations at Shihsanhang can be found in Yang Chun-Shih (楊君實 1961) and Liu Pin-Hsiung (1963). The first issue that puzzled archaeologists following the discovery of Shihsanhang was its cultural chronology. This problem was addressed by Yang Chun-Shih (楊君實 1961), Liu Pin-Hsiung (1963), and K.C. Chang (Chang 1969), who dated the remains at Shihsanhang before Taiwan's colonial era (considered to begin in A.D. 1624) and after the Neolithic Yuanshan Culture (ca. 3200-2300 B.P., after Kuo (2019)) and Botanical Garden Culture (ca. 2300-1800 B.P., after Kuo (2019)).

Notably, Liu Pin-Hsiung (1963) used the term "Ketagalan Culture" to describe what would later be known as the Shihsanhang Culture. Ketagalan refers to the tribe historically known to have dwelled in the Taipei Basin, a name Japanese ethnologist Ino Kanori coined. By using this name, Liu Pin-Hsiung bridged the archaeological culture to a known Indigenous group. This connection is further reiterated by Liu Yi-Chang (2002), who affirmed in his book that the Ketagalan tribe, or the historically recorded Tamsui Aborigines, are the cultural descendants of the Shihsanhang residents. I rely on these publications to justify my making analogies between the social lives of the Shihsanhang residents and those of the Tamsui Aborigines described in the ethnographic and

doi:10.6342/NTU202502709

ethnohistorical records.[7] But to clarify, my referring to ethnohistorical texts does not imply that I take the Shihsanhang residents and Tamsui Aborigines as the same group of people. Instead, with the assistance of these texts, I propose *ideas* about what the Shihsanhang residents were *probably* like.

However, to decode Shihsanhang's social activities and structure, archaeologists must investigate the material remains themselves, and this is precisely what Tsang Cheng-hwa (2010[2002]) does.

In chapter four of *The Prehistoric Residents in Shihsanhang*, Tsang (2010[2002]) puts forth a preliminary, holistic investigation of the residents' "cultural system." Tsang organizes the chapter around ten topics in sequential order: the body constitutions, family house, social organization, diet, clothes, transportation, life ceremonies, handicraft skills, trade behaviors, and descendants of the Shihsanhang residents. It is beyond the scope of this thesis to review everything discussed in this monograph, but to highlight, the social organization and life ceremonies topics influence my study profoundly. Quoting ethnohistorical texts broadly, Tsang speculates that monogamous households comprised the Shihsanhang society. When death occurred within these households, members would position the body into a flexed position and bury it next to family houses, a process which might involve rituals of some sort. In addition, the unequal distribution of grave goods, mostly imported items, to Tsang, signals differences in fortune and social status, which is "yet to be determined into definite ranks" (Tsang 2010[2002]).

[7] In this study, I prefer the term "Tamsui Aborigines" over "Ketagalan" to describe the same people who indigenously populated the Taipei Basin. Because, in ethnohistorical texts (Borao Mateo 2001; 黃叔儆 2021[1722]), these people were recorded to have spoken different languages and headhunted each other, and nothing that neared a "Ketagalan" identity was present. This seems to indicate that the "Ketagalan" tribe is merely a construct of ethnologists', and thus, I avoid projecting it into the past.

doi:10.6342/NTU202502709

Here, the question of social differentiation is brought into the picture. Echoing this line of inquiry, Chen Kwang-tzuu (2000) explores the ferrous metallurgical techniques of Shihsanhang and Wang Kuan-Wen (2016, 2018; 王冠文 2025) looks at the glass bead trade networks of Metal Age Taiwan.

Chen (2000) discovered that Southeast Asian bloomery smelting was adopted at Shihsanhang, a method that could be performed by a small group of people – such as a household. In addition, since the magnetite sand ore used for smelting was abundantly available on the beach adjoining the site, a monopoly over the raw material would have been impractical. Thus, the key to iron production was the knowledge of smelting rather than control over raw material, and several households could have participated in this production activity contemporaneously. This supports the proposition that the social groups producing iron at Shihsanhang were not rigidly centralized or stratified. In follow-up research (陳光祖, et al. 2019), Chen dates the introduction of iron technology to Shihsanhang to no earlier than ca. 1400 cal. B.P.

Wang Kuan-Wen's (2016, 2018; 王冠文 2025) analysis of the morphologies, chemical compositions, and circulation of glass beads reveals spatiotemporal distinctions in the distribution of different types of glass beads across Metal Age Taiwan. She identifies three primary circulation zones of glass and other materials across the Formosan Island during the 1st millennium A.D. – the East-Southeastern Region, the Southwestern Region, and the North-Northeastern Region (王冠文 2025). The North-Northeastern Region, where Shihsanhang is situated, pertains to the current study. Sites in this area tend to yield a greater variety and number of glass beads than those in other regions. The beads uncovered in the North-Northeastern Region are primarily Southeast Asian m-Na-Al and v-Na-Ca beads. However, after approximately the 10th to 12th century A.D., high-lead

doi:10.6342/NTU202502709

beads of Chinese origin increased in number in the Northeastern Region (王冠文 2025). Generally speaking, beads of Chinese origin gradually became the norm across Taiwan upon entering the 2nd millennium A.D. (Wang 2016, 2018). To sum up, the spatiotemporal differences in glass bead quality and quantity that Wang identifies imply shifts in the maritime trade networks of which pre-colonial residents of the Formosan Island were part (王冠文 2025).

Based on Chen's and her own research, Wang (王冠文 2025) proposes that Shihsanhang, or the North-Northeastern Region as a whole, was a "node of technical advantages" (Shennan 1999) within the circulation networks of glass and other artifacts across Taiwan during the 1st millennium A.D. The correlation between the influx of glass and other artifacts into the North-Northeastern Region and the development of ferrous metallurgical techniques in the same zone supports the following interpretation: having mastered Southeast Asian bloomery smelting, residents of this region, including the Shihsanhang residents, gained an advantage in procuring glass and carnelian beads, gold foil items, and bronze knife handles, etc., relative to inhabitants of other regions in Taiwan. This advantage, coupled with an expanded demand for imported goods, probably engendered the enlargement of settlement size and wealth accumulation at Shihsanhang.

Meanwhile, Liu Yi-Chang (劉益昌 2019), in his later publication, describes the maritime trade network that spanned across Taiwan and the South China Sea as the "Austronesian Road," which he dates from 2400 B.P. to around 1000 B.P. Liu argues that, by exporting Fengtian nephrite, the residents of the Formosan Island received glass and carnelian artifacts in return. The long-distance exchange also brought in itinerant craftspeople, who were skilled in ferrous metallurgical techniques and established settlements along the coast of northern and northeastern Taiwan. However, Han-Chinese

doi:10.6342/NTU202502709

merchants, whose trade networks quickly expanded during the early 2nd millennium A.D., interrupted the "Austronesian Road" and cut off the sailing routes of the residents of the Formosan Island.

The above research provides invaluable background knowledge for this thesis. At least two historically contingent events of which Shihsanhang was part are identified – the introduction of iron production technology by ca. 1400 cal. B.P., and a shift in the maritime exchange network by the 2nd millennium A.D. (ca. 1000 B.P.). Furthermore, the social structure of Shihsanhang did not seem to be rigidly stratified, though the unequal distribution of grave goods might indicate social differentiation to some extent.

However, after reviewing these studies critically, I found four issues looming behind them that I would like to reconsider and approach from a different perspective: First, there is a lack of intra-settlement chronological control in all of the mentioned studies. Second, the social is ontologically conceived as a systematic and functional whole, particularly in Tsang (2010[2002]) and Liu's (劉益昌 2019) work. Third, the settlement is treated as a self-evident social unit or a passive reflection of past social organization, as can be read in Tsang (2010[2002]) and Liu's (劉益昌 2019) publications, as well. And fourth, the social is understood in strictly anthropocentric terms in the discussed studies. In the following paragraphs, I explain these four issues in more detail.

4.1 The First Problem: The Lack of Intra-Settlement Chronological Control

The first problem stems from the limitations in the Shihsanhang data available several years ago, when all of the cited research was conducted. Back then, the remains had not yet been cataloged, and fewer C14 determinations were made compared to today. As a result, it seemed impossible to perform any chronological control over the remains.

doi:10.6342/NTU202502709

But without such control, Shihsanhang could only be treated as socially unchanging, whereas this is highly unlikely, given that the settlement persisted for over a thousand years. Some form of social change undoubtedly has taken place.

4.2 The Second Problem: The Social as a Systematic and Functional Whole

I now turn to the second problem. In his book, Tsang (2010[2002]) explicitly states,

> cultural system…is an interactive relationship between the compositions of this system and each other since any change in individual elements of the composition or in relationship of each other would drive systematic changes of the whole connection…[Culture] of human beings was formed by many various parts interactive functional with each other under one integrated cultural system; However, culture as one system also functional interactive with its surrounding environment system…Hence, changes of culture are outcomes due to constant adoption of outer environment and feedbacks from inner of the system due to the adoption (Tsang 2010[2002]:85).

Underlying Tsang's "cultural system" is systems theory, which primarily derives from Renfrew (1984, 2011[1972]), Binford (1962, 1965), and other archaeologists (e.g., Clark 2015[1957]; Plog 1975; Salmon 1978). Archaeologists upholding this theoretical vantage point treat the social as a cybernetic or mechanical system that confronts the natural environment in which humans are situated. The systematic whole is composed of multiple variables or sub-systems, each serving distinct functions and operating coherently to enable the persistence and equilibrium of the system. To cite just a few examples, Renfrew (2011[1972]) argues that

> Each of the subsystems of the culture is acting like a stabilised or regulated system, in the *cybernetic* sense. Their variables (food level in the subsistence system, population in the demographic situation, integrity in the defense system, social behaviour in the social system, belief behaviour in the religious system) are kept within assigned limits, as is necessary for survival [in nature] (Renfrew 2011[1972]:109. Emphasis mine).

doi:10.6342/NTU202502709

Meanwhile, Binford (1965) explicitly states that

> Culture is an extrasomatic adaptive system that is employed in the integration of a society with its environment and with other sociocultural systems…In cultural systems, people, things, and places are components in a field that consists of environmental and sociocultural subsystems, and the locus of cultural process is in the dynamic articulations of these subsystems. This complex set of interrelationships is not explicable by reduction to a single component – ideas – any more than the functioning of a motor is explainable in terms of a single component, such as gasoline, a battery, or lubricating oil (Binford 1965:205).

The organization of Chapter 4 in Tsang's monograph (2010[2002]) previously mentioned mirrors a flow diagram, reminiscent of those drawn by Renfrew (2011[1972]) and Clark (2015[1957]), the hallmarks of systems theory (Figure 7).

Tsang's focus on function also implies his postulation of the social as the "artefact which mediates between [humans] and the world of nature" (Renfrew 2011[1972]:94) or culture as humans' "extrasomatic means of adaptation" (Binford 1962). Here, human conducts are considered as "behaviors," i.e., the regularized patterns of people's activities in the system that fulfill adaptive goals, instead of "practices," that is, what people consciously or unconsciously perform in socioculturally meaningful ways (Pauketat 2001). Such a postulation can also be read in Liu's monograph (劉益昌 2019), where he writes that, at Shihsanhang, "graves without heads indicate war or headhunting *behaviors* between settlements or ethnic groups. People also relied on agriculture for subsistence, especially rice cultivation. Meanwhile, hunting and fishing were intensive" (劉益昌 2019:192. Translation and emphasis mine).[8]

[8] The original texts read as,

> 由無頭葬出現可知聚落或族群間可能有戰爭或獵頭行為。當時的人以農業為主要生業，種植稻米等農作物。同時漁獵也相當發達〔。〕(劉益昌 2019:192)

doi:10.6342/NTU202502709

Following Shanks and Tilley (1987), who argue that

> Theorizing a cultural entity as adaptive or functional simply affirms its existence and provides little comprehension of its specific form of articulation. To say that institutions and regularized customs of society are artefacts and can be regarded to fulfil functions broadly analogous to those of material artefacts which mediate between people and the natural environment, as Renfrew does, is to say nothing about why the institutions and customs take the specific form they do (Shanks and Tilley 1987:34).

I suggest that adaptational interpretations imply a teleology in the social system, which does not require explanations: "people headhunt" or "people bury the dead" because these behaviors are how they adapt to the environment, so they happen. Treating the social as a utilitarian "artefact" also indicates that the social is outside of people, that people have no role in shaping their social lives – "[social] change takes place 'behind the backs' of social actors who become irrelevant to the [systematic] analysis, mere 'components' of the system" (Shanks and Tilley 1987:139). Thus, any change in the social system can only be explained through input and output feedback from *outside of* the system, since only a change in the natural or sociocultural environments *outside of* a given social system can change the adaptation pattern. To be concise, the social in systems theory is analogous to machines, but takes no account of practices (Shanks and Tilley 1987).

Over the last several decades, apart from Shanks and Tilley (1987), other scholars (e.g., Joyce and Lopiparo 2005; Pauketat 2001) have ceased conceiving the social or cultural as a cybernetic system reducible to flow diagrams. In particular, Pauketat (2001) argues that all human doings are not mere "behaviors" or "extrasomatic means of adaptation" that normally happen. On the contrary, human doings are "practices," actions that are not necessarily biologically-determined or universal but are socially productive and spurred by the social. This means that, citing Joyce and Lopiparo (2005), the social is not necessarily dominative. It is not a cybernetic program that people comply with

doi:10.6342/NTU202502709

haplessly; instead, people's repeated practices change and are shaped by the social. There are no systematic flow charts, but rather, there are agents who embody the social in practices and thus produce the social (Pauketat 2001).

4.3 The Third Problem: The Settlement as a Self-Evident Social Unit or Passive Reflection of Social Organization

I now zoom in on the third problem, which relates to the conceptualization of the settlement. Tsang (2010[2002]) explicitly describes his investigation as "an analysis of 'settlement pattern.'" He quotes Gordon Willey (1953):

> the settlement pattern of human beings reflects the natural environment, the level of technology on which the builders operated, and various institutions of social interaction and control that the culture maintained. [It] offers a strategic starting point for the functional interpretation of archaeological cultures (Willey 1953:1).

This utilitarian notion can also be found in Liu's arguments: to requote, "graves without heads indicate war or headhunting behaviors between *settlements* or ethnic groups" (劉益昌 2019:192. Translation and emphasis mine).

I have discussed the drawbacks of the utilitarian and systematic ontology of the social in previous paragraphs. Here, I challenge Tsang and Liu's stances on conceptualizing material remains as passive "reflections" of the social, and pigeon-holing past people into anthropological constructs such as "settlements" and "ethnic groups."

In the mid-20th century, settlement archaeologists treated a social group as "a *co-residential* collection of individuals or households characterized by day-to-day interaction, shared experiences, and common cultures" (Murdock 1949, as cited in Canuto and Yaeger 2000b. Emphasis mine). A co-residential settlement was thus taken for granted as a social

doi:10.6342/NTU202502709

unit, forming the basis of settlement archaeologists' aim to "map social organization fairly directly on the ground" (Ashmore 2002).

This is precisely what Tsang does. Following Chang's (1958) and Trigger's (1967) idea that settlements represent how people socially grouped themselves and how the grouping is arranged over physiographic niches, Tsang treats settlement patterns as straightforward "reflections" of the environment, technology, and social institutions or interactions in which people were embedded or which they maintained. His underlying goal is to identify the type of social organization represented by a given settlement pattern and deduce its function within a larger sociocultural or ecological system.

In response to such a view, Ashmore (2002) would argue that this renders people's intentional or unconscious manipulation of artifacts, or social ends engendered by the active participation of artifacts to shape trajectories of social affiliation, beyond consideration.

Liu, as well, seems to operate on an equally reductive framework in which he focuses his research attention on pursuing only two kinds of social units that he sees as existing in Metal Age Taiwan: "people" (or "ethnic group") and "settlement." Other than the quote provided above that treats settlements as social units engaging in headhunting, in an earlier publication, he explicitly uses the word "ethnic group" (族群 *zu qun*) to describe the people living at Shihsanhang (劉益昌 2002). Thus, it seems to me that, for Liu, both social entities are self-evident and naturally existing.

However, we should consider the wide variety of social groups that persist among the Taiwanese Austronesian-speaking groups into the present: clans (馬淵東一 2017; 黃應貴 2012), houses (Chiang 2010; 蔣斌 2023; 黃應貴 2012), labor-exchange groups (王

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梅霞 2006), tribal meeting houses (楊淑媛 2005), or the *gaga* of the Tayal (王梅霞 2006, 2023), which organizationally imitates all of the above but cannot be neatly categorized into any of them. Concepts of "settlement" and "ethnic group," in contrast, only emerged in the interpretation or demarcation of Austronesian-speaking groups' social order under the strategic governance and ethnological classifications of the Japanese colonial authority in the early 20th century (林開世 2014; 黃應貴 2012, 2020). By projecting these categories into Metal Age Taiwan, Liu risks shoehorning the past into predefined classificatory schemes.

Indeed, archaeologists must consider more possibilities of social affiliation when approaching the past (Graeber and Wengrow 2021). Particularly, before projecting pre-categorized social units into the past, archaeologists should ask: Who participated in what kind of social entity? And how can such an entity probably be identified through the material remains? This brings me to the fourth and last issue.

4.4 The Fourth Problem: Anthropocentrism

All of the previous Shihsanhang literature takes humans as the sole agent behind social persistence and changes: *People* searched for iron ore and produced iron (Chen 2000; 劉益昌 2019); *People* exchanged beads (Wang 2016, 2018; 王冠文 2025); *People* grew rice (Tsang 2010[2002]; 劉益昌 2019); *People* exploited the natural environment by hunting and fishing (Tsang 2010[2002]; 劉益昌 2019). The anthropocentric perspective underlying these studies is not necessarily wrong, but I suggest that following it exclusively reveals only part of the story. The attempt to bring back the "missing masses," i.e., the many non-humans and their associations between each other or with

doi:10.6342/NTU202502709

humans, which make the social possible (Latour 1992), may complement the blind spots of this perspective.

In recent years, certain scholars have advocated that the social consists not only of humans, but is comprised of and made possible by objects (Latour 1992, 2005), cosmic deities (Sahlins 2022), or other species (Tsing 2015, 2018). Such propositions stand in contrast to previous, human-centered delimitations of the social. This said, while archaeologists in the past treated artifacts as passive "intermediaries" of utilitarian behaviors or symbol endowments, they may now acknowledge their active roles in the construction of the social and treat them as "mediators" (Latour 2005).[9] Archaeologists may also strive to explore how non-humans compose social groups hand in hand with humans. This can be seen in Harris (2014b), who proposes that "communities are thus assemblages of people, places, animals and things, bound together at times by co-presence, but always by particular kinds of practice." In the "Theoretical Background" section, I articulate the assertions made in this paragraph more comprehensively by introducing assemblage theory, the theoretical stance that I adopt in the current study to address the issue of anthropocentrism.

4.5 Section Summary

Past research on Shihsanhang argues for a sociocultural genealogy that bridges the site to the ethnographic Tamsui Aborigines. Past research has also investigated the probable social units behind iron production and outlined the spatiotemporal changes in the quantities and qualities of glass beads and other foreign goods across the Formosan

[9] I elaborate on the distinction between "intermediary" and "mediator" in more detail in the "Theoretical Background" section.

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Island. While I applaud and am nourished by these studies, I suggest that some aspects are worth further exploration. They are:

1. Although the Shihsanhang site can now be dated from ca. 1800 cal. B.P. to ca. 550 cal. B.P., better intra-settlement chronological control over the remains is needed to see social changes in this settlement site.

2. The social is not a flow chart or a system – it is embodied in practices (Shanks and Tilley 1987). This renders a reevaluation of such approaches as Tsang's (2010[2002]) systematic and functional analysis of the Shihsanhang "social system" as crucial.

3. Settlement and ethnic group are not self-evident social units. Archaeologists should strive to identify social units that were constructed through practices by past people, rather than shoehorning them into academic constructs. Thus, both Tsang's (2010[2002]) and Liu's (劉益昌 2019) conclusions regarding settlement and ethnic group require re-evaluation.

4. In recent decades, various academic studies on other ontologies of the social have emerged. The anthropocentric perspective underlying earlier studies is not necessarily wrong. However, by drawing non-humans into the picture, I can contemplate how humans and non-humans construct the social hand in hand, and produce a picture of the social at Shihsanhang where non-humans play active parts.

doi:10.6342/NTU202502709

CHAPTER 5: THE RESEARCH QUESTIONS

Having elucidated the limitations of past research, let me now return to my research aim, which is to investigate how assemblage-cum-communities were assembled at Shihsanhang. I need to examine empirically how mortuary data, which embody past funerary practices, provide insights into the putting-together of humans and nonhumans into working compounds and the territorialization of the identities and internal cohesiveness of these compounds. More specifically, I am required to empirically differentiate communities in Shihsanhang, investigate the encounters between the mourners, the deceased, and the grave goods within assemblage-cum-communities, and explore the capacities of these human and non-human components of the assemblage-cum-communities. A more comprehensive introduction to the theoretical perspective of my research will follow soon, but for now, I will restate the research questions and elaborate on them.

How were the Shihsanhang residents, both human and non-human, interrelated with each other? If a settlement site such as Shihsanhang should not be taken as a self-evident social unit in itself, what kind of social entities larger than each individual member should we reconstruct Shihsanhang as accommodating? What was put into practice to "assemble" these social entities, and what were their relations? Last but not least, how can I address these questions by investigating the people and things related to death – graves, burial goods, the deceased, and the living (mourners), etc., at Shihsanhang? These interrogations require several empirical questions related to the Shihsanhang remains for addressment, and they include but are not limited to:

1. *How are burials spatially patterned in the Shihsanhang site, and what do the spatial interrelations between the burials indicate? More specifically, do the Shihsanhang*

doi:10.6342/NTU202502709

burials manifest clustering distribution patterns? On the other hand, are there spatial outliers? If so, what do they socially indicate?

This first question is based on the "Saxe/Goldstein approach" (Morris 1991), which is widely employed for demarcating communities, or other kinds of social entities, in mortuary spatial patterns. This generalizing approach was developed by Saxe (1970) and Goldstein (1981), and it aims to bridge persistent, "formal disposal areas" of graves with the characteristics of the social groups that inhumate in this manner. Tested against ethnographic data, Saxe's generalization reads as,

> To the Degree that Corporate Group Rights to Use and/or Control Crucial but Restricted Resources are Attained and/or Legitimized by Means of Lineal Descent from the Dead (i.e. Lineal Ties to Ancestors), Such Groups Will Maintain Formal Disposal Areas for the Exclusive Disposal of their Dead, and Conversely. (Saxe 1970:119)

This generalization is crucially vital in mortuary archaeology, as it treats mortuary remains as indicators of the social entities – corporate groups – that produced such remains. The importance and broad application of the hypothesis compelled scholars, among whom Goldstein was the most well-known, to reverify it (Morris 1991). Testing the generalization against ethnographic data again, Goldstein (1981) proposed her revised version of it:

> [I]f a permanent, specialized, bounded area for the exclusive disposal of [a] group's dead exists, then it is likely that this represents a corporate group that has rights over the use and/or control of crucial but restricted resources. This corporate control is most likely to be attained and/or legitimized by means of lineal descent from the dead, either in terms of an actual lineage or in the form of a strong, established tradition of the critical resource passing from parent to offspring. (Goldstein 1981)

doi:10.6342/NTU202502709

Based on the quotes, I postulate that if I observe clustering patterns in the graves, these patterns would likely imply that communities existed at Shihsanhang. I view the grave clusters detected by GIS analytical tools – Average Nearest Neighbor and Buffering – as estimations of the "bounded areas" for inhumation, which the Shihsanhang residents intentionally demarcated. I explain the details of cluster identification in "The Research Methods" section.

I use the word "community" instead of "corporate group" to emphasize the constructive nature of a social group as emerging via practice (Morris 1991). This is because the spatial relationships between burials are not mere reflexive patterns, but are the realization *per se* of the tie between the interred individuals and the living, especially in the context of residential burials (Adams and King 2010; McAnany 2010). I refer to this as a landscape of *relatedness* (Carsten 1995), and I will elaborate on this concept further in the following section.

Meanwhile, taking heed of the cultural specificity neglected in this generalization, I also consider the ethnohistorical accounts of the Tamsui Aborigines. Elsewhere, based on GIS-assisted analyses, I have argued that cemeteries at Shihsanhang were spatially associated with domestic structures and served to differentiate social units, tying the Shihsanhang residents to the following ethnohistorical accounts (Zhang 2023). During the Qing Colonial Era, Huang (黃叔璥, et al. 2021[1722]) recorded that "when a savage dies, timbers are used to make a coffin, and the body is buried next to the house" (translation mine).[10] I can thus conclude that spatial correlation existed between a particular kind of social entity, as indicated by the word "house," a common social unit

[10] The original texts read, "番死，用枋為棺，瘞於厝邊" (黃叔璥 et al. 2021[1722]). In Chinese, the word 厝 (house) refers to a domestic structure, or a social unit, where the ancestors, gods, and humans live together (葉春榮 2006).

doi:10.6342/NTU202502709

operating around kinship among Taiwanese Austronesian-speaking groups (Chiang 2010) and the cemetery it maintained. In this study, I thus refer to such a social entity, as embodied in the cemetery, as a community (Carter 2023).

2. *What differences in terms of grave goods quantity and quality exist among burials? What do they socially signal and achieve? In particular, is there an unequal distribution of grave goods as a whole? Do different types of grave goods exhibit distinct distribution patterns?*

While past archaeologists (Binford 1971; Peebles and Kus 1977) treated the unequal distribution of grave goods as directly reflecting status differentiation, I lean toward the point of view that draws practice into consideration, where "the dead do not bury themselves" (Rakita and Buikstra 2005). Thus, placing burial goods should be treated as embodying human-intended social ends at the encounters between the living, the deceased, and the artifacts. The natures of such ends and how artifacts mediated these ends are also the subject of analysis.

Artifacts might play various roles during funerary practices (Ekengren 2013). Particularly, they may release *mediatory capacity* and *mnemonic capacity* during funerary practices. Mediatory capacity refers to an artifact's capability to "transform, translate, distort, and modify the meaning or the elements they are supposed to carry… [according to] the intimate nature of entities" (Latour 2005:39). Mnemonic capacity illustrates an artifact's ability to "connote and consolidate the possession of past events associated with their use or ownership… to be talked about and invested with the memories and striking events associated with their use" (Rowland 1993:144). These active roles can be inferred through the spatial, qualitative, and quantitative distinctions of grave goods and their

doi:10.6342/NTU202502709

associations with the individuals with whom they were interred (Tainter 1975; Yao 2005). I will elaborate on these arguments in more detail in the "Theoretical Background" section.

3. *How do the observed differences of sex, age, posture, and pathology of the skeletons correlate with the above two questions? More specifically, questions to ask include: What is the dominant posture of skeletons? Are the posture anomalies spatial outliers, and are they interred with grave goods? Are the skeletons of distinct sexual traits and ages spatially segregated? Do individuals of certain sexual traits, ages, or pathological features tend to be buried with specific types of grave goods, or more grave goods as a whole? What do these traits socially indicate?*

This question follows upon the discussions provided below the two preceding questions. I consider some of the graves' outlying locations and other mortuary treatments that deviate from the mainstream as embodying the social anomalousness of individuals spatially isolated from the majority (Parker Pearson 1999). I may also investigate other dimensions of how the mourners conceived and treated the interred individuals. To be specific, if burials are spatially organized around the deceased's age or sexual characteristics, or if particular types of grave goods were solely accorded to specific age or sex categories, then the living were likely putting particular ideals about communal affiliation (Sullivan and Rodning 2010) or personhood (Toohey, et al. 2016) into practice.

4. *To what extent do the analytical results, as produced to answer the above questions, manifest spatial or chronological differences?*

Lastly, I postulate that spatial variation in mortuary remains among contemporaneous graves likely indicates distinctions in communities' funerary practices, intentional or unconscious. By comparison, historical processes generate temporal

doi:10.6342/NTU202502709

dissimilarities in funerary practices, within or across communities. I interpret such contemporaneous or chronological dissimilarities in funerary practices as embodying social precarity and heterogeneity, which are key dimensions of the concept of assemblage and which I explained in the following section. Thus, by scrutinizing the spatiotemporal differences within and across communities through burials, I expect to investigate the social precarity and heterogeneity that could have occurred within Shihsanhang's occupation history.

Before I delve into the methodological pathways to answer these questions, being fully aware of the scholastic baggage of the terms – "assemblage," "practice," and "community," among others – so far used, I now turn to the theoretical stance of this study.

doi:10.6342/NTU202502709

CHAPTER 6: THEORETICAL BACKGROUND

How can I multi-scalarly investigate how communities were territorialized at Shihsanhang through mortuary data? In the previous sections, I articulated how past research is based on ontologies of the social as functional and as a cybernetic system. Here, setting myself in opposition to this theoretical stance, I explicitly refer to the concept of "assemblage" to inspect how people and things are related to, and assemble with, each other. I primarily cite from DeLanda (2006, 2016), but at times refer to Latour (1992, 2005), Bennett (2010), and Ingold (1993, 2021) for building a theoretical background that pertains to my research. I subsequently draw on archaeological discussions about communities as a bridge between theory and analysis. Finally, I elaborate on how the mortuary data from Shihsanhang pertains to the theoretical discussions.

6.1. Assemblage Theory

An assemblage is an entity assembled, or put together, from different-natured components (both human and non-human) through historical processes. It should be seen as a working compound of internal cohesiveness that acquires an identity from the interactions between its components (Bennett 2010; DeLanda 2006). Whereas the English word "assemblage" implies an articulated and static configuration (Antczak and Beaudry 2019), the original French term, *agencement* (Deleuze and Guattari 1987), emphasizes movement – that is, the ongoing nature of putting together (DeLanda 2016).

In stark contrast with the Saussurian, organismic, or cybernetic metaphor underlying concepts of "structure" and "system" (e.g., Binford 1965; Renfrew 2011[1972]; Sahlins 1981), the properties of these components do not become "relations of interiority"

doi:10.6342/NTU202502709

(DeLanda 2006, 2016), i.e., when a component's properties are defined solely by or are reducible to the component's causal-linear relations with other components (DeLanda 2006). Instead, the components contain properties *in themselves*. When these properties correspond to each other and produce a happening,[11] the correspondence is termed "capacity" (DeLanda 2006). Any component can thus be detached from an assemblage and join another without altering its properties (DeLanda 2016). To sum up, while a system highlights cybernetic co-functioning and equilibrium, an assemblage is a volatile, throbbing confederation, an ad hoc grouping of diverse elements that manages to work as a compound with an identity by releasing capacities (Bennett 2010; DeLanda 2006).

Picture a garden fashioned from flowers in vibrant colors.[12] Many species call this setting home. Above the garden, sparrows hover, feeding on the insects that thrive among the flowers, and the vegetation draws nutrients from the soil. Humans were also involved in pruning the expanding twigs and foliage. Scholars from the last century would call this setting a "system" and analyze how different components functioned interdependently to sustain the equilibrium of the garden: The flowers transformed particular minerals and compounds in the earth into digestible nutrients for insects. The insects facilitated the reproduction of the vegetation by pollinating it, yet also prevented it from overgrowing by consistently feeding on it, coupled with people's maintenance of the garden. But why did the insects not burgeon in population, given the abundance of herbs? That was because the sparrows, occupying the apex of the garden food chain, kept the number of insects under control.

[11] A "happening" is the effect put forth by a cohort of components but greater than the sum of the components (Tsing 2015). "Assemblages," says Tsing (2015:23), "don't just gather lifeways; they make them. Thinking through assemblage urges us to ask: How do gatherings sometimes become 'happenings,' that is, greater than the sum of their parts?" Thus, for example, when a bee meets a flower, something greater than mere bee + flower happens — pollination. This is further elucidated in the main text.

[12] I made up this example based on the cited theoreticians' articulations.

doi:10.6342/NTU202502709

From past scholars' vantage point, the garden was analogous to a human organism (e.g., Redcliffe-Brown 1971), where each element's properties – flowers, soil, insects, and sparrows – are defined by their relations with each other, in parallel with a liver's properties in a human body being contingent on its relations with other organs (DeLanda 2006). As stated, some (e.g. Binford 1965; Renfrew 1984, 2011[1972]) may also analogize the garden to a machine or cybernetic program, where a stimulus in component X (say, the dying out of insects) elicits a result in component Y (the over-flourishing of vegetation, perhaps) in a causal linear manner (Pauketat 2001). In such analogies, none of the elements could exist on their own or easily detach from the system. How could the system of the garden not crumble if one of its components were removed, just like how a human could not live without a liver, or how a computer ceases to operate without a driver? Flowers, livers, and drivers had no properties in themselves when removed from the garden or a human body, and vice versa, the garden, human body, or computer could not function properly without the vegetation, the organ, or the program.

Conceiving this garden as an assemblage requires, first, describing how each component is related to each of the others, and the relation is called "capacity" (DeLanda 2006). A capacity is an element's latent potential to interact with other elements by whatever means, but it may or may not be exercised (DeLanda 2006; Robinson 2017). It stems from the properties of each element *per se*, but takes a multi-component working group as the locus (Bennett 2010). Take a bee, for example (DeLanda 2016): the insect possesses a full range of properties – buzzing, waggle dancing, crawling, and sucking, among others. However, its *capacity to pollinate* is released at its confrontation with flowers, when all of a sudden, the mentioned properties enter into a *contingent obligation* with the flowers. To say that their encounter is *contingently obligatory* means that a bee meets a flower due not to some intrinsic design of the organismic or cybernetic garden

doi:10.6342/NTU202502709

system. Instead, their encounters with flowers are overtly contingent – at some point in the evolutionary history of insects and plants, some bugs met particular parts of certain plants, engendering each other's reproduction. The bugs and plants concomitantly evolved into bees and flowers, and an obligatory bond was consolidated between the two organisms. Bees collect pollen as food, and flowers require pollination to reproduce. Without each other, neither could survive. Capacity is grounded in the inherent properties of the elements of an assemblage, but it only occurs via or between a contingent working cohort assembled over time (DeLanda 2006, 2016).

Conversely, even if a bee does not pollinate, it will buzz, crawl, dance, and suck as well as ever – its relation with flowers does not affect its properties. This allows the bee to be detached from the flowers or the garden and interact with other things out there without losing its properties. To exemplify further, it may sting an innocent graduate student walking past the garden – *voilà*, contingency and a new *capacity to hurt*.

The garden is no longer a system when perceived through this angle. The relations between the sparrows, flowers, insects, and soil depend on their history of encounters, and the co-occurring, contingently obligatory release of capacities. They may all detach from each other without affecting the properties of the others. Thus, the garden assemblage is where, spatiotemporally, heterogeneous species and things exercise a variety of capacities that engender the assemblage's formation. The assemblage remains open-ended and fluid, always in a state of becoming (Tsing 2015).

This said, we should view assemblages as multi-scalar. After all, every species within the garden assemblage is itself assembled from divergent cells and bacteria. Here, I extend Bennett's (2010) argument that "humans [and non-humans] are composed of various material parts (the minerality of our bones, or the metal of our blood, or the

doi:10.6342/NTU202502709

electricity of our neurons)" (Bennett 2010:10), which makes humans and non-humans themselves assemblages. Thus, the mentioned bee's properties result from the assembling processes of many cells and other materials.

Or, when a larger geographical scale is considered, the garden, together with many other assemblages such as apartments, roads, markets, and so on, encounters with the others to form the city landscape, a larger assemblage *sui generis*. This assertion is made in reference of DeLanda's (2006) account,

> [T]he interactions between members [(components)] of a collectivity [(assemblage)] may lead to the formation of more or less permanent articulations between them, yielding a macro-assemblage with properties and capacities of its own. Since the processes behind the formation of these enduring articulations are themselves recurrent, a population of larger assemblages will be created leading to the possibility of even larger ones emerging (DeLanda 2006:17).

Concisely speaking, assemblages are relational, and which entities are viewed as assemblages depends on the scale in question.

We can also read in this description that an assemblage is irreducible to the sum of its components because the parts produce something beyond their total (Bennett 2010; DeLanda 2006). "The reason why the properties of a whole [assemblage] cannot be reduced to those of its parts," writes DeLanda, "is that they are the result not of an aggregation of the components' own properties but of the actual exercise of their capacities" (DeLanda 2006:11).[13] In particular, the recurrent exercise of capacities

[13] Meanwhile, Bennett (2010) proposes a similar explanation:

> The effects generated by an assemblage are, rather, emergent properties, emergent in that their ability to make something happen (a newly inflected materialism, a blackout, a hurricane, a war on terror) is distinct from the sum of the vital force of each materiality considered alone. Each member and proto-member of the assemblage has a certain vital force, but there is also an effectivity proper to the [assemblage as a whole] (Bennett 2010:24).

doi:10.6342/NTU202502709

constitute not only the properties of an assemblage, but also the assemblage's identity and internal cohesiveness (DeLanda 2006). The identity and internal cohesion of an assemblage are two sides of the same coin, for inter-component interactions, i.e., capacity releases, "stabilize the identity of an assemblage by increasing its degree of internal homogeneity or the degree of sharpness of its boundaries" (DeLanda 2006:12). Lest the "homogeneity" here may confuse with the heterogeneous ontology of an assemblage,[14] in the current study, I use "cohesion" or "cohesiveness" to denote such scalar "homogeneity."[15]

The term "territorialization" describes the emergence and stabilization of such identity and internal cohesiveness, and the term comprises two dimensions: one spatial,

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I underscore Bennett's argument that an assemblage produces something more than the sum of the "vital force" of its members (or components, in DeLanda's terms). To translate it into DeLanda's language, I consider this "vital force" as aligning with a component's properties. In this sense, Bennett's mention of "effect" becomes quite compatible with the concept of capacity, which I define at the start of this section as the correspondence between components' properties that produce a happening. As discussed in Footnote 10, a "happening" is the effect put forth by a cohort of components but greater than the sum of the components (Tsing 2015). Are a blackout, a hurricane, or a war on terror not happenings?

[14] This assertion does not contradict the proposition that an assemblage is gathered from *heterogeneous* parts. DeLanda exemplifies how the mentioned increase in internal homogeneity and sharpening of boundaries may happen through "the sorting processes which exclude a certain category of people from membership of an organization, or the segregation processes which increase the ethnic or racial homogeneity of a neighbourhood" (DeLanda 2006:13) based on the acknowledgement that assemblages are always ontologically heterogeneous in his later publication. DeLanda clarifies,

> Assemblages are always composed of heterogeneous components. It could be objected that the examples examined so far, communities and organisations, seem to be made out of homogeneous parts: persons. This objection is indeed correct. [However,] to properly apply the concept of assemblage to real cases we need to include, in addition to persons, the material and symbolic artifacts that compose communities and organisations [and ethnic neighbourhoods]: the architecture of the buildings that house them; the myriad different tools and machines used in offices, factories, and kitchens; the various sources of food, water, and electricity; the many symbols and icons with which they express their identity. The day-to-day practices of neighbours and co-workers take place in well-defined locales populated by heterogeneous material and expressive objects, so any concrete community or organisation, when treated as an assemblage, must include these locales explicitly (DeLanda 2016:20).

Thus, the homogeneity of an assemblage does not erase the heterogeneity among components. In this light, it seems fair to construe homogeneity and heterogeneity as relative and scalar. Within an assemblage, components remain diversity. However, when compared to other assemblages, the components of a specific assemblage may exhibit more internal consistency.

[15] DeLanda does not use this term extensively, yet he does explicitly invoke it when stating,

> Components that do not increase the internal homogeneity of an assemblage, or the degree of sharpness of its boundaries, may still reinforce the identity of the whole by limiting its rate of change, increasing its stability, or contributing to its overall cohesion (DeLanda 2006:13. Emphasis mine).

I thus use the word "cohesion" or cohesiveness" to describe the same context of the use of "homogeneity."

doi:10.6342/NTU202502709

and the other related to habitual repetition (DeLanda 2006), i.e., repetitive interactions or recurrent practices.[16] To illustrate again with the garden example, the garden territorializes by occupying a specific patch of land, and by the sparrows, flowers, insects, and people interacting with each other in certain ways *recurrently* within this landscape. The sparrows anticipate aggregates of specific species of insects in this piece of land, therefore hovering about it every day. The bees habitually repeat their visit to this piece of land to find particular types of flowers, and the flowers bloom one after another persistently. And most importantly, people practice the maintenance of the garden by recurrently cutting overgrown vegetation. These processes contribute to one's pointing at this piece of land and saying it is "a garden" instead of something else.

In reverse, any eventful act that destabilizes or changes the garden's identity is termed "deterritorialization." Deterritorialization does not necessarily overthrow the identity of the garden, but it can also enhance it or alter it (DeLanda 2006).[17] Now, the

[16] DeLanda comments on territorialization by stating,

> [T]he processes of assembly through which physical, biological and social entities come into being…must be conceptualized as *recurrent*. This implies that assemblages always exist in *populations*, however small, the populations generated by the repeated occurrence of the same processes. As the assemblages making up these collectivities interact with one another, exercising a variety of capacities, these interactions endow the populations with some properties of their own, such as a certain rate of growth or certain average distributions of assemblage properties (DeLanda 2006:16. Emphasis original).

On page 50, he writes that "[t]he main territorializing process providing [an] assemblage with a stable identity is *habitual repetition*" (DeLanda 2006:50. Emphasis original). And to elaborate on human's habitual repetition within assemblages, DeLanda cites Bourdieu (1990),

> Bourdieu's explanation of the observed statistical correlations is that different sets of objective opportunities and risks condition the day-to-day *practices* of groups leading to the development of a durable set of dispositions, tendencies to behave in certain ways and to display certain aspirations (DeLanda 2006:64. Emphasis mine).

Thus, I use the word "recurrent practice" to denote the habitual repetition conducted by humans.

[17] Let us consider some examples that DeLanda provides. To name but a few, he illustrates deterritorialization by mentioning communication technologies,

> Any process which either destabilizes spatial boundaries or increases internal heterogeneity is considered deterritorializing. A good example is communication technology, ranging from writing and a reliable postal service, to telegraphs, telephones and computers, all of which blur the spatial boundaries of social entities by eliminating the need for copresence: they enable conversations to take place at a distance, allow interpersonal networks to form via regular correspondence, phone calls or computer communications, and give organizations the means to operate in different countries at the same time (DeLanda 2006:13)

Or, consider the young child who learns how to swim or bike:

doi:10.6342/NTU202502709

gardener decides to add flower-evocative chemicals to the garden. The vegetation subsequently thrives, so do the insects. Here, the chemicals act to deterritorialize the garden by enhancing the density of flowers, thereby constituting a more gardened garden. Or the added chemicals can be herbicides. The plants subsequently die out, and the organisms flee. The garden identity then disappears – another trajectory of deterritorialization.

I should also highlight the conceptualization of the garden assemblage as a landscape, rather than merely as a piece of "land" or a "space." "Land is a kind of lowest common denominator of the phenomenal world, inherent in every portion of the earth's surface yet directly visible in none, and in terms of which any portion may be rendered quantitatively equivalent to any other" (Ingold 1993:153). Meanwhile, space describes a "passive backdrop" (Knapp and Ashmore 1999) of human or non-human movements, or a "vacuum" to be inscribed with meanings that derive from such movements (Ingold 1993). A landscape, on the other hand, is "an enduring record of – and testimony to – the lives and works of past generations [of species] who have dwelt within it, and in so doing, have left there something of themselves" (Ingold 1993:152). A landscape is qualitative and heterogeneous, perpetually under construction via the very interactions between humans and non-humans, instead of being "pre-prepared" for the passive containment of interactions (Ingold 1993).

When a young child learns to swim or to ride a bicycle, for example, a new world suddenly opens up for experience, filled with new impressions and ideas. The new skill is deterritorializing to the extent that it allows the child to break with past routine by venturing away from home in a new vehicle, or inhabiting previously forbidden spaces like the ocean. New skills, in short, increase one's capacities to affect and be affected, or to put it differently, increase one's capacities to enter into novel assemblages, the assemblage that the human body forms with a bicycle, a piece of solid ground and a gravitational field, for example. Of course, the exercise of a new skill can soon become routine unless one continues to push the learning process in new directions (DeLanda 2006:50).

As can be read in these exemplifications, deterritorializing processes destabilize an assemblage's identity and cohesion by enhancing them, or detaching some components from the assemblage, hence undermining the assemblage's identity and cohesion.

doi:10.6342/NTU202502709

Thus, the garden is not a vacuum or a backdrop where the assembling processes of insects, plants, and people take place. Instead, the very assembling processes of the garden-cum-assemblage, i.e., territorialization, constitute the garden as a landscape. Following Ingold's (1993) articulation, past bees and flowers "left something of themselves" by constituting each other's lives to produce present bees and flowers; the present form and distribution of vegetation is the "testimony" to past pruning practices. I should stop repeatedly emphasizing that the garden, as a landscape, is assembled from the interactions, or capacity releases, between human and non-human components. To sum up, I suggest that we construe the spatial dimension of territorialization as landscape construction.

Analyzing an assemblage thus means scrutinizing what components enter or exit it, and what capacities are recurrently released between them (DeLanda 2006) – historical tracing. This statement is grounded in DeLanda's (2006) assertion that

> [W]e must instead focus on the *historical processes* that produce those products [(assemblages)]…The identity of any assemblage at any level of scale is always the product of a process [(territorialization)] and it is always precarious, since other processes [(deterritorialization)] can destabilize it" (DeLanda 2006:28. Emphasis mine)

To further illustrate this assertion with examples, DeLanda articulates that

> No organization would be able to keep its identity without the ongoing interactions among its administrative staff and its employees; no city could keep its identity without ongoing exchanges among its political, economic and religious organizations; and no nation-state would survive without constant interactions between its capital city and its other urban centres. In technical terminology this can be expressed by saying that territorializing processes are needed not only historically to produce the identity of assemblages at each spatial scale but also to maintain it in the presence of destabilizing processes of deterritorialization (DeLanda 2006:39).

doi:10.6342/NTU202502709

To trace assembling processes is thus to observe the temporal flows of such "interactions," i.e., capacity releases. More specifically, underlying capacity release is a temporal flow from when a contingently obligatory encounter has not happened to after the release of capacities. Therefore, to trace assembling processes, one must observe this temporal flow of when components encounter, or, in the reverse, cease to confront each other, which serves to territorialize or deterritorialize an assemblage (DeLanda 2006, 2016).

In addition, such historical tracing, particularly when done to human practice, does not merely treat the past, present, and future as mere dots on a timeline (Hamilakis 2017). Instead, "the present is not marked off from a past that it has replaced or a future that will, in turn, replace it; it rather gathers the past and future into itself, like refractions in a crystal ball" (Ingold 1993:159). Thus, for example, the spots where people prune the expanding twigs and foliage from the garden in the present are decided by where they pruned in the past. The ways of pruning are grounded in "a durable set of dispositions" (DeLanda 2006:64) formed through, and embodying, the developmental history of such ways. Hence, pruning is not a mere independent practice, but a reenactment, a capturing of the past of the same practice in the present moment of pruning, which projects toward similar practices in the future.

Of course, once an assemblage is territorialized, specific limitations and opportunities for the assemblage are established (DeLanda 2016). This assertion is grounded in DeLanda's explanation:

> Once an assemblage is in place it immediately starts acting as a source of limitations and opportunities for its components…The capacity of a close-knit community to enforce local norms, and the capacity of an organisation to impose rules and obedience to commands, are clearly a source of constraints to their human components. But a close-knit community also tends to be solidary, an emergent property that provides a resource to its members when it comes to political mobilisation…Philosophically, this double

doi:10.6342/NTU202502709

> determination is important: wholes emerge in a bottom-up way, depending causally on their components, but they have a top-down influence on them (DeLanda 2016:21).

Thus, when a garden is territorialized, what follows are limitations and a (limited) range of opportunities regarding how components interact with each other and what components enter or exit the assemblage. For example, people limit what grows in this area by persistently removing weeds. Now that the sparrows are here daily, a cat is attracted to the garden, abruptly joining the assemblage. As shown, the limitation over vegetation burgeoning and the opportunity of a specific species joining the garden assemblage stem from what already existed within the garden and the components' interrelationships, i.e., its unique identity of being a garden.

6.2. Assemblage and Community

Enough about the garden. How is it possible to bridge the concept of assemblage with the archaeological subjects I wish to study here– the social world of the Shihsanhang residents? To do so, I refer to the archaeology of communities.

Since the 21st century, archaeologists have striven to address most of the problems I discussed in previous sections, particularly those regarding whether or not the social works as a cybernetic system, whether a settlement site can be taken as a self-evident social unit, and how humans manipulatively organize all kinds of objects to achieve social objectives. Those who favor the concept of community (e.g. Birch 2014b; Canuto and Yaeger 2000a; Düring 2007, 2013; Harris 2013, 2014b; Lin 2019; Varien and Potter 2008), loosely defined as a dynamic socially constituted institution that is contingent upon practices for its construction and persistence (Canuto and Yaeger 2000b), argue that any form of social affiliation should never be taken for granted or thought of as always being internally coherent (Birch 2014a; Canuto and Yaeger 2000b). Conceiving the social as

doi:10.6342/NTU202502709

systematic or merely "an artefact which mediates between [humans] and the world of nature" (Renfrew 2021[1972]:94) also risks treating people as *outside of* the social instead of as constructing it, and such postulations deviate from how people experience, practice, and produce the social both in the past and present (Pauketat 2001; Shanks and Tilley 1987).

Resonating with anthropological ideas in the late 20th century about the fluidity, historical specificity, and constructed nature of identity (see Anderson 2016[1991]; Barth 1994), advocates of the archaeology of community endorse the notion that communities are "constituted and continually reconstituted by its members' practices" (Yaeger 2000) instead of something that naturally exists. Accordingly, archaeologists are encouraged to pay close attention to the everyday or eventful practices that generate and maintain communities, rather than assuming that social institutions such as lineages, villages, or ranks normally exist (Birch 2014a; Canuto and Yaeger 2000b). In addition, community is constantly in flux, being shaped and reshaped during specific historical circumstances through various practices, including the patterning of domestic structures (Mehrer 2000; Preucel 2000), pottery production (Bartlett and McAnany 2000; Dietler and Herbich 1998), or recurrent inhumation beneath residential areas (Düring 2007, 2013). To sum up, while those who champion systematic thoughts see human behaviors as "symptoms" of positive/negative feedback or programmed according to some functional norms (Renfrew 2011[1972]), archaeologists endorsing the idea of community see practices (rather than socially neutral, objective "behaviors") as socially shaped and shaping the social (Joyce and Lopiparo 2005; Robb 2010).

The shift in focus onto community formation is indeed a significant stride in archaeological discussions of the social. As yet, viewed through the theoretical lens

doi:10.6342/NTU202502709

related to ontologies developed over the last three decades (e.g., Ingold 1993, 2021; Latour 1992, 2005; Tsing 2015, 2018; Vivero de Castro 1998), some archaeologists have made attempts to draw non-human or other aspects of ontology – animals, artifacts, bodies, affect, among others – into investigations of communities (Alberti and Bray 2009; Harris 2014b).

Following Harris (2013, 2014b), I posit that a community can be treated as a specific scale of assemblage. Assemblage theory and the concept of community are compatible because community is formed through a variety of practices, which are often mediated by objects (Antczak and Beaudry 2019), or, what Latour refers to as "mediators" (Latour 2005) or the "missing masses" (Latour 1992) of the social. A "mediator" denotes an entity that "transform, translate, distort, and modify the meaning or the elements they are supposed to carry… [according to] the intimate nature of entities" (Latour 2005:39). Such entities can be artifacts or assemblages of humans and non-humans, e.g., a computer or a banal conversation. Mediators can be understood through the concept of capacity. Consider the example Latour provides to illustrate a mediator, which is positioned against a passive *intermediary* that merely reflects meanings provided by preexisting social differences:

> [L]et's say a shine of silk instead of nylon – is taken as an intermediary transporting faithfully some social meaning – 'silk is for high-brow', 'nylon for low-brow'–then it is in vain that an appeal has been made to the detail of the fabric. It has been mobilized purely for illustrative purposes. Even without the chemical difference between silk and nylon, the social difference between high- and low-brow will have existed anyhow; it has simply been 'represented' or 'reflected' on a piece of cloth that has remained wholly indifferent to its composition. If, on the contrary, the chemical and manufacturing differences are treated as so many mediators, then it may happen that without the many indefinite material nuances between the feel, the touch, the color, the sparkling of silk and nylon, this social difference might not

doi:10.6342/NTU202502709

> exist at all. It is this infinitesimal distinction between mediators and intermediaries that will produce, in the end, all the differences we need between the two types of sociologies (Latour 2005:40).

I found it acceptable to say that silk and nylon release their *capacity to mediate* social signals (high-brow and low-brow) through their feel, touch, color, and sparkling properties during encounters with humans without distorting the theme of either the quote or assemblage theory. I refer to this capacity as the *mediatory capacity* of artifacts in the following discussions, and will soon return to introduce this further. But for now, suppose a group of people chooses to wear silk in their daily lives – an overt practice – to signal their wealth, thus constructing a community centered on the display of affluence; the silk, as the mediator, is essential to this community formation. I therefore argue that community, practice, and non-human mediators can be framed with assemblage theory.

Quoting Harris (2014b), I define a community as an assemblage at a "specific [scale of spatiality and practice] that always involves [multiple] human beings." Extending the garden metaphor to Shihsanhang, I am required to search for the recurrent practices that territorialized the identity of, and construct a landscape of, communities; I will need to probe the potential capacities of humans and non-humans to delimit a past community; I will also need to explore the historical processes that marshal or detach these components; and I must contemplate how all of the above can be done multi-scalarly. These inquiries open up an alternative to the systematic and functional ontologies of the social, an alternative that draws on the openness, precarity, and heterogeneity during the assembling processes of communities.

6.3. Exploring Communities through Burials

How can I through mortuary data multi-scalarly investigate the recurrent practices, the capacities, and the historical processes that territorialized communities at

doi:10.6342/NTU202502709

Shihsanhang? To do this, I first concentrate on three mortuary components at Shihsanhang that are indicative of and make up communities: the mourners, the graves, and the grave goods. Following this, I elucidate the scales to be studied in this thesis.

Let me begin with the capacity and recurrent practices of the mourners, namely, burying the dead. The Shihsanhang residents repeated the practice of putting the dead in a flexed position with their head oriented to the southwest in graves dug around domestic structures. There were also other recurrent funerary practices, as Tsang (Tsang 2010[2002]) suggests, such as preparing the grave goods, bending the corpse into a flexed position, and digging a hole in the ground. Within such encounters between the living and the dead, the mourners reenacted and embodied past funerary practices in the current practices, and this further determined the locations and range of variation in future funerary practices (Yao 2016). Here, I quote Yao's (2016) theorization of incorporative funerary practices:[18]

> Incorporative practices evoke the past through bodily gestures as elicited by particular social contexts (e.g., rituals, processions, and funerals). Even though bodily gestures leave ephemeral traces, their routinized performance is expected to generate structured remains within a given setting. In a cemetery, for instance, a consistent orientation of bodies over periods of burial activity not only indicates a habitual way of disposing of the corpse, but also reveals a coordination of mourners' bodily motions and gestures in accord with ritual expectations (Yao 2016:56).

Based on the argument made so far, I propose that the capacity of the recurrent funerary practices lies in their determination of future counterparts. Here, as previously mentioned, history is not presented as dots on an ever-progressing timeline, but a selected past is embodied within the current moment of practice, which projects toward future practices

[18] Citing Van Dyke and Alcock (2003), Yao (2016) defines incorporative practices as "learned bodily movements and dispositions" (Yao 2016:55) in contrast with "inscribed practices, which refer to material actions that explicitly preserve, store, and encode knowledge for transmission." (Yao 2016:56).

doi:10.6342/NTU202502709

(Hamilakis 2017; Yao 2016). Indeed, "every given present [of practice] carries with it all pasts, but, of course, through the selective process of memory, only specific pasts are conjured up at any specific present moment" (Hamilakis 2017). Of course, this is also intimately related to the deceased's capacity.

The deceased releases the capacity of "being here" (Sahlins 2022) during encounters with the living in the form of residential burials. This capacity is grounded in the animistic nature of the dead, defined as a "developmental process in which the dead acquire their permanence and efficacy through the reiterative and cumulative practices of the living" (Velasco 2014), which "endowed [the deceased] with life force" (Velasco 2014).

I cite Sahlins (2022) to further elaborate on the notion of "being here." He proposes that most cultures are "cultures of immanence," where humans are surrounded by enspirited beings, termed "meta-persons," within the same world instead of another transcendent world.

> The cultures of immanence, enspirited cultures, know only one world in which people interact with the myriad of nonhuman subjects, from the deities to the dead. These species of meta-persons may have their own habitats, from the heavens to under the ground or the sea, but they are co-present, visibly or invisibly, with human beings in the one great cosmic polity. There is no "other world"…Immanence is a quality of being. Being is being there, and being there is *being here* (Sahlins 2022:38. Emphasis mine).

Ancestors are a type of meta-person (Sahlins 2022). After the *rite de passage* of death (van Gennep 1960), a deceased individual is transformed into one of the ancestors of a given community. They become the "the object of prayer, sacrifice, feasting, ritual dancing, and other cultic practices, the physical counterparts of which are the 'sacred' groves, shrines, images, *graves*… and so forth, by means of which communication with the honored dead is established" (Sahlins 2022:96. Emphasis mine).

doi:10.6342/NTU202502709

This argument is particularly well-suited to the social worlds of Taiwanese and Austronesian-speaking groups, where the dead were not considered as inanimate "bodies" to be disposed of, but were active individuals who remained within and continued to engage with their communities after residential inhumation. For instance, until the early 20th century, the Bunun buried the corpses of men who had achieved many feats (e.g., successful headhunts) during their lifetime near the door of their slate houses, where they lived with their kin. This was because their strong *hanitu* (soul) could protect the family members who lived within. In contrast, the corpses of non-adults, whose *hanitu* had been very weak, were interred within the house near the hearth, because fire was the household source of power and provided protection (黃應貴 2012); The Tayal in Yilan buried the deceased underneath the beds within houses, and the *gaga* of the dead – the soul or a form of power – would rise with the smoke of the hearth and bless the headhunting knives that were placed on the shelf above.[19] Children should refrain from mischief in the beds, since this would offend the ancestors (達少 and 歐嗨 2021). Indeed, death for the Taiwanese Austronesian is not a hapless termination of an organism's life, but a *rite de passage* that ancestralizes the dead, which transforms the dead into a state of "being here."

Consider also the "ritual song" of the Tamsui Aborigines, who "[buried the dead] beneath the houses or in some nearby area," as noted in Jesuit Father Jacinto Esquivel's article in 1633 (Borao Mateo 2001:157). The song[20] was recorded by Huang Shu-Jing (黃

[19] This was what a Tayal elder and cultural revivalist, called Wei Jian-Fu (韋建福), told me when I did fieldwork in Nan'ao, Yilan.

[20] The original texts read,

噯晚日居留什（虔請祖公），
噯晚眉（虔請祖母），
街乃密乃濃（爾來請爾酒），
街乃密乃司買單悶（爾來請爾飯共菜）。
打梢打梢樸咖薩嚕塞嗼（庇祐年年好禾稼），
樸咖薩嚕朱馬喈嚼喈（自東自西好收成），
麻查吱斯麻老麻薩拉（捕鹿亦速擒獲）。(黃叔璥 et al. 2021[1722])

doi:10.6342/NTU202502709

叔璥, et al. 2021[1722]), the Imperial High Commissioner of the Qing Empire in the early 18th century, and the translation is mine:

> Respectfully invite the grandfathers and grandmothers,
>
> Come and receive the wine and food!
>
> Do bless us with beautiful crops every year,
>
> Good harvests from east to west,
>
> And also, do bless us with the swift capture of deer!

Even through the culturally tinted lens of an 18th-century Chinese literati, I can still infer that the "grandfathers and grandmothers," namely, the ancestors, played a vital role in the Tamsui Aborigines' social world. As spiritual participants of the social, they continue to give life and be a source of well-being for the living. Humans were not the authors of crop growth or deer capture, but rather the humble recipients of their ancestors' efforts (Sahlins 2022). I boldly tie the Shihsanhang residents' ontology of the dead to this ethnohistorical analogy.

To wrap up, the capacity of "being here" sustains the membership and active participation, or, *tie of relatedness* (Carsten 1995),[21] of the deceased individuals in their communities, especially within the contexts of residential burial (Adams and King 2010; McAnany 2010). This is supported by McAnany's (2010) generalizing remarks,

[21] "Relatedness" denotes the "acting out and conceptualizing relations between people" (Carsten 1995:224). This term bears a kinship notion, which I find compatible with the close association between residential burials and houses as kinship units among Taiwanese and Southeast Asian Austronesian-speaking groups (Carter 2023; Chiang 2010). Carsten (1995) argues that relatedness is practiced in cultural-specific, indigenous ways. For example, the Malays in Langkawi acted out the relatedness between house members by sharing particular substances in the body, including blood, milk, and food. I consider residential burial an archaeologically observable approach to practice relatedness, particularly in the cultural contexts of the Austronesian speakers in Taiwan and Southeast Asia.

doi:10.6342/NTU202502709

> The selectivity of membership in "memory communities" appears to be indicated by who is interred residentially – and so remembered – as well as by the residential or community group that prepares, maintains, and refurbishes burial facilities (McAnany 2010:137).

Citing the definition of landscape mentioned previously, namely, "an enduring record of – and testimony to – the lives and works of past generations who have dwelt within it, and in so doing, have left there something of themselves" (Ingold 1993), I suggest that the mentioned tie of relatedness engendered by the "being here" of the dead within residential areas is itself landscape making. Henceforth, I view the Shihsanhang residential burials as a mortuary *landscape of relatedness*.

I now turn to the capacity of grave goods. Their capacity stems from their capabilities to "make a difference" during confrontations between the living and the dead, that is, to release the mediatory capacity previously defined. More specifically, their mediatory capacity is characterized by their fulfilment of mourner-intended social ends via their association with the corpse or other funerary artifacts. This allows the witness of a funerary rite to "make a causal inference of some kind, or an inference about the intentions or capabilities of another person" (Gell 1998). For example, when mourners put precious goods within a headhunting hero's grave for commemoration, the grave goods "make a difference" by "persuading" those who witness to treat the deceased as a great figure (Graeber 1996), thus freeing the mourners from repeatedly saying "this person is a headhunting hero." Here, artifacts serve as mediators between living and deceased humans (Latour 2005). It is the encounters of artifacts and humans, working as an assemblage, that make the social ends of funerary rites, namely, the *rite de passage*, possible.

doi:10.6342/NTU202502709

Grave goods could initially be personal belongings, bodily ornaments, heirlooms, or even animate things, among other categories of artifacts loosely classified by archaeologists (Ekengren 2013). However, grave goods were meant to be buried, meaning their burial was to remove them from circulation and sensory experience. Here, I suggest that, in addition to the mentioned mediatory capacity, grave goods also released a *mnemonic capacity*. I follow Rowlands' (1993) theorization of destroyed ceremonial objects such as grave goods:

> In contexts where objects are destroyed or taken out of circulation through burial […], such objects become a memory in their absence, and therefore the essence of what has to be remembered [in the future…They] have themselves become embodied memories, objectified and condensed as a thing (Rowland 1993:146-147)

These artifacts and their capacity thus project toward the future – they become remembrances of artifacts' mediatory capacity for the witnesses of the funerary rites, and the witnesses carry on such memories after the funerary rituals (Joyce 2003; Rowlands 1993).

While I discuss the capacity of each significant component of the Shihsanhang mortuary individually, in practice, it is difficult to disentangle them or assign discrete roles to them within a community. This is because an assemblage is always a "meshwork" (Ingold 2021) of diverse elements, ever in a state of becoming (Antczak and Beaudry 2019). To impose specific, bounded roles on these elements would risk misrepresenting the nature of assemblages and aligning myself with the very propositions critiqued in earlier sections.

The next consideration is the scales of this research. The catalogued mortuary data records for Shihsanhang's excavations document the posture and repertoire of grave

doi:10.6342/NTU202502709

goods at *the level of individual graves*. Building on the capacities of the mourners, graves, and burial goods, the focus of this study centers upon how these components collectively constituted groups at *the community level*, and how distinct communities may have interacted with one another. These interactions further indicate a broader assemblage at the *cross-community level*. Confirming whether these levels held meaning to the Shihsanhang residents or were mere archaeological constructs is likewise a concern of this study.

Finally, I delve into the precarity induced by the historical contingencies identified by past scholars – the introduction of iron production technology around ca. 1400 cal. B.P., and a shift in the maritime exchange network by ca. 1000 B.P. These contingencies unfolded within and across the three relative scales outlined above, namely, the level of individual graves, the community level, and cross-community level.

6.4. Section Summary

This section serves as a bridge between the archaeological materials and the theoretical framework I employed, specifically assemblage theory. At the start of this section, I introduced what an assemblage, or to assemble, means: to put together heterogeneous (human and non-human) components into a working compound that generates an identity and internal cohesion from the interactions between the components (Bennett 2010; DeLanda 2006). The putting together and interactions of components are characterized by contingently obligatory encounters and capacity release, rather than the linear causality implied in a cybernetic system (DeLanda 2006).

A community, an assemblage at a scale larger than an individual but smaller than the whole Shihsanhang site, is the primary scale of focus of this study. Opposing settlement

doi:10.6342/NTU202502709

archaeologists' reductive framework, in which co-residence = shared identity = self-evident social unit, the idea of community highlights people's socially constructive practices of identity. I suggest that this emphasis on practice resonates with the concept of territorialization in assemblage theory (DeLanda 2006), i.e., the practical process of identity creation in landscapes (Ingold 1993). Meanwhile, practices are mediated by objects, thus adding a non-human aspect to community territorialization (Latour 1992, 2005). Therefore, a community can be treated as an assemblage.

How can I see communities in burials? More specifically, what are the capacities of the mourners, the dead, and the grave goods, and what practices were involved in territorializing communities in the Shihsanhang mortuary landscape? I suggest that the capacity of practice is temporal. Burying the dead in specific ways embodies past similar practices and projects toward future similar practices. Therefore, the capacities of grave goods are mediatory and mnemonic (Latour 2005; Rowlands 1993). Mediatory means to transport, modify, or distort social meanings (Latour 2005), and mnemonic means to be able to condense remembrances of mediatory capacity in an artifact to be buried (Rowlands 1993). Finally, the dead's capacity of "being here" in the residential areas (Sahlins 2022) amounts to the maintenance of ties of relatedness. Together, the living, the deceased, and the artifacts comprising the burial goods construct a mortuary landscape of relatedness, which makes an assemblage-cum-community possible.

Nevertheless, to render the assemblage-cum-communities at Shihsanhang analytically visible, I must rely on methods and tools, inasmuch as field archaeologists employ excavation strategies and dig with trowels. The data, methods, and tools form the focus of the following sections.

doi:10.6342/NTU202502709

CHAPTER 7: THE SHIHSANHANG MORTUARY DATA AND DATA PROCESSING METHODS EMPLOYED

Before presenting the analytical results, in this section, I demonstrate what data records were available and made use of in my research, and explain how I integrated and transformed the available data records into analyzable datasets.

7.1. The Available Data Records

The datasets of this study derive from the bulk of field records from Sectors B, C, and H from the 1990 to 1992 rescue project field seasons, which produced two types of field records. The "Excavation Field Notes" track each spit in every 2-meter by 2-meter sub-unit (Figure 4), as introduced in the "Background of the Shihsanhang Site" section. These field notes include the measurements of the top and bottom of every spit and natural layer, as well as measurements of the openings and bottoms of features, and document the remains from each spit. Profile and plan drawings of each sub-unit are usually attached as well.

The second type of filed records are the "Mortuary Field Notes," which contain detailed descriptions of each burial's context, grave goods, and other concomitantly discovered remains. The notes also include plan drawings and measurements of graves and each element within the burials, along with other observations made by the excavators.

I reviewed both types of field records to collect mortuary information, which I recorded within a Microsoft Excel spreadsheet that I created for this task. Former project participants had previously created a spreadsheet containing multiple types of mortuary information – such as locations (unit codes), orientations of heads, postures, preservation conditions, measurements of openings, and measurements of bottoms – for all 257 burials,

doi:10.6342/NTU202502709

and this also contained records of most grave goods categories (glass beads, glass bracelets/earrings, carnelian beads, and copper artifacts). Separate spreadsheets documenting skeletal sex, age, and pathological traits had also been created independently. I integrated these multiple spreadsheets into a single, more comprehensive burial inventory.

The skeletons were sexed by Project Assistant Cheng Ya-Yun and Former Project Assistant Bien Yu-Hao. By scrutinizing sexual dimorphism in the ventral arcs, subpubic concavities, ischiopubic ramus ridges, greater sciatic notches, and preauricular sulcus, Cheng categorized the skeletons into four sexual categories – "male," "male?", "female?", and "female" – based on whether their traits appeared strongly male, somewhat male, somewhat female, or strongly female. Skeletons exhibiting ambiguous sexual traits were recorded as "unidentifiable."

As for ages, by referring to the methods devised by Brothwell (1981) and Miles (1962), Cheng segregated the skeletons into eight age classes: infant (<2 years old), young child (2 to 5 years old), child (6 to 12 years old), adolescent (12 to 16 years old), young adult (17 to 24 years old), adult (25 to 34 years old), mature adult (35 to 45 years old), and elderly adult (>45 years old). Similarly, skeletons too fragmented for age identification were labeled "unidentifiable."

Last but not least, pathologies. Yang Zong-Ru (楊宗儒 2023) has compiled a list of osteological observations for all the skeletons from Shihsanhang in his master's thesis and during his subsequent participation in the IHP project. The pathologies include external auditory exostosis (EAE), Schmorl's node, porotic hyperostosis, osteophyte formation, cribra orbitalia, dental calculus, dental caries, enamel hypoplasia, alveolar

doi:10.6342/NTU202502709

rolling, alveolar recession, alveolar abscess, fracture, squatting facet, and periosteal reaction. These pathologies are recorded as present or absent.

In this study, I draw on Cheng's and Yang's sex and age classification results and pathological observations. I enumerate these skeletal traits to make them computationally processable. I grade skeletons that show strongly male traits as "-1," somewhat male traits as "-0.5," somewhat female traits as "0.5," and strongly female traits as "1." Meanwhile, I leave sexually neutral or unidentifiable traits blank. This is because, if I enumerate sexually neutral or unidentifiable traits as "0," during correlation analysis, the R language would treat it as an ordinal category and calculate its correlation value with other variables. However, this would warp the analytical result, because sexually neutral or unidentifiable skeletons are not an analytically meaningful category, but exclusions from the other individuals that can be sexed.

For ages, I record infants (<2 years old) as "0," young children (2 to 5 years old) as "1," children (6 to 12 years old) as "2," adolescents (12 to 16 years old) as "3,", young adults (17 to 24 years old) as "4," adults (25 to 34 years old) as "5," mature adults (35 to 45 years old) as "6," and elderly adults (>45 years old) as "7." I left individuals whose ages were undiscernible as "blank." The rationale underlying this move is identical to that underlying the enumeration of sexual traits – individuals with undiscernible ages are not an analytically meaningful category. Lastly, the binary records of pathologies are recorded as "1" or "0."

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7.2. Processing the Data Records

Two issues arose while I reviewed the data records to compile mortuary information. These issues are related to (A) the association of grave goods to specific burials, and (B) confirming the chronological sequences of graves, which I address as follows.

7.2.1. Associating the Grave Goods Incident Data with Specific Burials

During research, I noticed that while the Mortuary Field Notes included repertoires of grave goods for each burial, some of these items were not included in the corresponding spreadsheets. Additionally, some remains, though found within the same 1m by 1m sub-sub-units and spits as certain burials, were not recorded as grave goods either. This issue was further complicated by the fact that many plan drawings did not illustrate burial cuts, rendering the verification of such remains as grave goods difficult. After discussing this matter with Professor Wang Kuan-Wen, one of the co-directors of the IHP project, I decided that in this thesis, I would handle this problem by classifying any item as a grave good so long as it was either listed in the grave goods inventories in the field notes, or was located within the same 1-meter by 1-meter sub-sub-unit and two spits of a burial, and positioned near the skeleton.

In cases of double or triple burials, it can be uncertain as to how to associate grave goods with one specific individual is sometimes ambiguous, as some grave goods were located between or scattered among skeletons. In such cases, I associate the grave goods with multiple individuals. Take HM014 and HM025, for example: the two individuals form one double burial, within which over 4,000 glass beads were found scattered between bone fragments. Since associating these beads with either of the two individuals was impossible, during my creation of the final burial inventory, both HM014 and HM025

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were recorded as having these beads. Given that these cases were rare, and I pay special attention to these cases when interpreting the analytical results, I do not think the resulting datasets affect analytical outcomes to a great extent.

Notably, because the Shihsanhang remains are still under cataloguing, the counts of iron artifacts, animal bones, and animal beads have not yet been announced. Thus, while I record the incident data of grave goods in the final burial spreadsheet, these three categories are recorded in the form of binary present-absent data.

Furthermore, the final burial inventories and the following analyses only include intact glass beads. It is difficult to estimate the original number of glass beads in each grave based solely on the counts or weights of fragmented specimens.

As for carnelian beads, I calculate the average weight for each bead shape, as well as the overall mean weight of an individual bead regardless of shape. I then divide the weight of fragmented beads with known shapes by the former, and those with unknown shapes by the latter, to approximate the original count of carnelian beads for each grave. Since the reconstructed bead counts never exceed four, and given that this study aims to identify general trends in the distribution of grave goods rather than to specify the precise social signals of *exact* quantities, I believe these approximations do not substantially affect the study's objective.

7.2.2. Chronological Control

Chronological control was conducted by applying a relative-dating method that I first developed during my bachelor's thesis research on the Shihsanhang site (Zhang 2023), and which I describe below.

doi:10.6342/NTU202502709

The relative dating method involves considerations of the depths of the bottom of the Shihsanhang Culture Layer, the depths of the openings of burials, and the amount of fragmented remains within the burial backfill. Through this, I could divide the burials into two chronological groupings: those that have openings either *at the base of* the Shihsanhang Culture Layer (which I label as "0") and those *within* that layer (which I label as "1").

This method is grounded in the stratigraphic laws outlined by Harris (2014a). Figure 8 illustrates the formation sequence of a burial. If I define 1 as the Shihsanhang Culture Layer, 2 as the Seepage Layer, 3 as the burial backfill, and 4 as the placement of the corpse, burial goods, and initial fill around them, and 5 as the cut for the grave, then burials with cuts – 5 – that truncate 2 and the Natural Layer predate those that have cuts truncating 1, 2 and the Natural Layer. Because stratigraphically speaking, the former type of cut was made *before* the formation of 1, and the latter type *during* or *after*.

Even though, according to the field notes, not all burial cuts were observable, 3 still serve as reliable paths for relative dating.[22] According to the field notes, the excavators recorded that the "backfill" (壙土 *kuang tu*) of some of these burials contained relatively more irregularly distributed and fragmented remains than other portions of the same spit. These remains include potsherds, shell fragments, and small iron slags, etc., some of which can be confidently traced to earlier features located above and truncated by the

[22] If a skeleton was uncovered on top of the Seepage Layer but without an obvious cut, two scenarios are possible:

a. The corpse was placed on top of the living floor in the open and left uninterred;

b. The corpse was inhumed, but the cut was either unidentifiable or overlooked by the excavators.

Given that at Shihsanhang, evidence supporting (a) — such as heavily disturbed, scattered, or animal-gnawed bones (Rattenbury 2018) — was scarce, scenario (b) is the more probable explanation, and therefore the burial must have cut through the Shihsanhang Culture Layer despite the cut being unidentifiable.

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burials, such as shell middens and suspected iron-smithing sites. The excavators, therefore, regarded them as evidence that the burials had indeed cut through the Shihsanhang Culture Layer. Thus, I treat burials whose backfill was said to contain "much" fragmented remains as chronologically later than those that do not.

I am not the first to apply a relative-dating method to the Shihsanhang remains. Similar reasoning underlies nearly all of the descriptions of the burial contexts written by Liu Yi-Chang, one of the directors of the 1990-1992 salvage excavations. In fact, during the salvage projects, he had already differentiated burials from relatively "earlier" or "later" periods by scrutinizing the openings and cuts of graves. I consider his comments invaluable for reconstructing the chronological sequence of the graves. I believe Liu's *in situ* observations of the graves are more accurate than my post-excavation data processing.

With this method, I have divided the burials within Sectors B, C, and H into six spatially and stratigraphically distinct groups. These burial groups are:

a. 51 graves in Sector B that have openings at the base of the Shihsanhang Culture Layer

b. 38 graves in Sector B that have openings within the Shihsanhang Culture Layer

c. 25 graves in Sector C that have openings at the base of the Shihsanhang Culture Layer

d. 23 graves in Sector C that have openings within the Shihsanhang Culture Layer

e. 82 graves in Sector H that have openings at the base of the Shihsanhang Culture Layer

f. 37 graves in Sector H that have openings within the Shihsanhang Culture Layer

doi:10.6342/NTU202502709

As yet, given that the demarcation of Sector B, C, and H was artificial and arbitrary, how am I able to confirm whether, say, burials in Sector H that have openings *within* the Shihsanhang Culture Layer are contemporaneous with their counterparts in Sector B or not? I am now confronted with the problem of verifying the temporal sequence of the six burial groups synthetically.

Here, radiocarbon determinations fit into the picture. After reviewing the C14 determinations from features in the three sectors that have openings *within* or *at the bottom of* the Shihsanhang Culture Layer, I found that they affirm the feasibility of my relative-dating method. Table 1 and Figure 9 illustrate the relevant C14 determinations to this research and where they stem from. The calibration of the Libby dates was performed by Professor Wang Kuan-Wen with Oxcal v4.4.4 (Bronk Ramsey 2021), r.5, and the IntCal20 calibration curve (Reimer, et al. 2020). Radiocarbon samples yielded from features that have openings *within* the Shihsanhang Culture Layer are bolded.

As can be read in Table 1, from 1100 to 900 cal. B.P. seems to be the dividing period between burials whose openings are different in Sector B and H. As for burials in Sector C, those that have openings within the Shihsanhang Culture Layer are all dated after approximately 1400 cal. B.P. but before 900 cal. B.P. The huge 2δ ranges of some determinations prevent me from acquiring a more precise temporal sequence, but still, I can produce a very general one and name each phase. The chronological sequence comes as follows:

a. Phase 1 (ca. 1800-1400 cal. B.P.): Burials from Sector C that have openings *at the bottom of* the Shihsanhang Culture Layer. 25 burials are dated to Phase 1.

doi:10.6342/NTU202502709

b. Phase 2 (ca. 1400-1050 cal. B.P.): Burials from Sector C that have openings *within* the Shihsanhang Culture Layer, and burials from Sector B and H that have openings *at the bottom of* the Shihsanhang Culture Layer. 156 burials are dated to Phase 2.

c. Phase 3 (ca. 1050-500 cal. B.P.): Burials from Sector B and H that have openings *within* the Shihsanhang Culture Layer. 75 burials are dated to Phase 3.

7.2.3. Creating the Feature Points of Skeletons on the GIS Software

During my bachelor's thesis research, I created the polygons and feature points of all Shihsanhang burials in GIS software (ArcGIS Pro and QGIS), in addition to the shapefile of each standard unit (Zhang 2023). I utilized the "georeferencing" tool to position the plan drawings of each burial in their discovery unit. After this, I manually created a feature point for each skeleton at where the head should be. Then, I transformed all the records of the mentioned final burial inventory into GIS datasets by utilizing the "joins and relate" function, which automatically relates the information in the inventory to each feature point according to the code of each skeleton.

7.3. The Final Dataset for Analysis

Figure 10, Figure 11, and Figure 12 present the final dataset of each chronological phase for the following analyses.

7.4. Section Summary

In this section, I outline how I transform the mortuary data records from Shihsanhang into analyzable datasets. This involves enumerating the information for each burial, properly associating the grave goods with the respective burials, conducting chronological control, and combining the final inventories with the Shihsanhang graves'

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feature points in ArcGIS Pro and QGIS. Notably, the chronological control involves scrutiny of the openings of burials to determine the relative dates of the mortuary data. To verify the relative dating results and confirm the contemporaneity of graves across the three selected sectors – Sectors B, C, and H – I examined the 11 radiocarbon determinations from burials and other features. The final datasets for analysis comprise 25 burials dated to Phase 1 (ca. 1800-1400 cal. B.P.), 156 burials dated to Phase 2 (ca. 1400-1050 cal. B.P.), and 75 burials dated to Phase 3 (ca. 1050-500 cal. B.P.). Now that I have explained how I prepared the datasets, I move on to introduce the analytical tools employed in this research.

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CHAPTER 8: THE RESEARCH METHODS

I adopted two methodological approaches – one spatial and the other statistical – to analyze the mortuary datasets. The spatial approach is assisted by the QGIS 3.34.11 and ArcGIS Pro 3.5.0 software, while the statistical approach is conducted with R Studio 3.0.3. In this section, I list all the analytical tools utilized and explain why I adopted them and how they function. The spatial tools are as follows: Average Nearest Neighbor, Buffering, and Global Moran's I. The statistical tool includes Spearman's correlation Coefficient and cluster analysis.

8.1 Spatial Analysis

The analytical results of the three GIS functions – Average Nearest Neighbor, Buffering, and Global Moran's I – answered the research questions in distinct ways. The questions answered via spatial analysis include: How are burials spatially patterned in the Shihsanhang site, and what do the spatial interrelations between the burials indicate? Are graves with burial posture anomalies spatial outliers, and are they interred with grave goods? Are the skeletons of particular sexual traits and/or ages spatially segregated? I used the Average Nearest Neighbor tool to determine the manually-defined radius for buffering, aiming to demarcate the mortuary clusters in different phases to identify communities based on the Saxe/Goldstein Approach (Goldstein 1981; Morris 1991; Saxe 1970) discussed above. By utilizing the Global Moran's I function, I tested whether specific sexual traits or age ranges manifest spatial aggregation.

8.1.1. Average Nearest Neighbor (ANN)

I use the ANN tool to evaluate whether the burial datasets from all three phases manifest clustered, dispersed, or random distribution patterns. The ANN function

doi:10.6342/NTU202502709

operates by postulating a hypothetical random distribution with the same scale and number of features of a given dataset and then calculating the expected mean distance between the features among this hypothetical distribution. Next, the ANN function calculates the observed mean distance between the features from the dataset in question. Then, by dividing the observed mean distance by the hypothetical expected mean distance, the ANN function yields an ANN ratio. If the ANN ratio is less than 1, i.e., the observed mean distance is smaller than the expected mean distance, than the distribution pattern in question is considered clustered; If the ANN ratio is greater than 1, i.e., the observed mean distance is larger than the expected mean distance, than the distribution pattern in question is considered dispersed (ArcGIS_Pro n.d.-a).

Since burial clusters formed through time, I include feature points from the preceding period(s) when I conduct the ANN analysis upon the burial feature points from Phases 2 and 3. I do recognize the possibility that later residents of Shihsanhang may not have been aware of the existence of earlier burials, so that the clustering patterns that I detected were mere results of coincidence. However, consider this quote from Patricia Bian (陳光祖, et al. 2023b),[23] the former research assistant who administered the Shihsanhang mortuary data cataloging at IHP,

> Despite the clustering of graves and temporal gaps between the construction of adjoining graves, cases of unpatterned truncation or disturbance between graves are rare, taking into consideration the sheer extent of clustering. This raises the probability that during inhumation, the Shihsanhang residents knew very well about, or had marked out, the locations of other graves (陳光祖 et al. 2023b:66. Translation mine).

[23] The original texts read,

> 即便墓葬之埋藏有聚集的現象，存在墓葬間因先後埋葬而打破之情形，但以其聚集程度來說比例偏低，不排除十三行先民在埋葬其先人骨骸時，對於其他墓葬之位置有相當之了解或標記。(陳光祖 et al. 2023b:66).

doi:10.6342/NTU202502709

Based on this quote, I speculate that the burial clusters at Shihsanhang were maintained and remembered by the residents. Thus, to include feature points from the preceding period(s) when I conduct the ANN analysis upon the burial feature points from Phases 2 and 3 is reasonable.

The environment for calculation is set as Sector C for graves from Phase 1. As for graves from Phase 2, the environment for calculation is set as the sum of the areas of Sectors B, C, and H. For Phase 3 counterparts, the environment is set as the sum of the areas of Sectors B and H.

8.1.2. Buffering

To visualize the burial clusters identified by the ANN tool, I use the "Graphic Buffer" tool to draw circles around burial feature points. More specifically, to approximate the spatial extents and locations of these clusters, which I interpret as consciously constructed and maintained by the Shihsanhang residents, I set the radii slightly smaller than the observed mean distances produced by the ANN function. This is because the distances between feature points belonging to the same cluster are shorter than the observed mean distances generated by the ANN tool, which averages all distances between feature points. By setting the mean distances as buffer width, I approximate these intervals as the appropriate distances between graves as assumed and practiced by the Shihsanhang residents.

Having drawn the buffers of burials, I manually delete the buffers that do not intersect with at least two other buffers, which is due to my definitional consideration that a burial cluster should comprise at least three burials. Then, I use the "Dissolve Boundaries" tool to merge the remaining buffers that intersect with each other. Again, I

doi:10.6342/NTU202502709

include feature points from the preceding period(s) when I draw buffers for the burial feature points from Phase 2 and Phase 3.

However, the observed mean distances between burial feature points are not identical throughout the three phases, which makes buffer sizes fluctuate. Thus, to retain and incorporate the burial cluster sizes and boundaries identified in an earlier period with those demarcated in a later period, I use the "Dissolve Boundaries" tool.

8.1.3. Global Moran's I (GMI)

The GMI tool statistically measures the spatial distribution of quantitative characteristics of objects. It evaluates whether the quantitative characteristics of a given set of features are clustered, dispersed, or randomly distributed. The GMI index ranges from -1 to +1, with -1 representing a dispersed distribution, 0 representing a random distribution, and +1 representing an aggregated distribution of the given quantitative characteristic. Furthermore, the smaller the p-value, the less likely that the distribution pattern is due to random chance. This means that even a small deviation of the GMI index from 1, 0, or -1 may be statistically significant if the p-value is very low, i.e., <0.05 (ArcGIS_Pro n.d.-b; Chiang 2010).

In my study, I use the GMI tool to assess the spatial distribution of sexual traits and age, which indicates whether any burial cluster is structured around these two vital aspects of social identity. The environment for calculation is set as Sector C for graves from Phase 1. As for graves from Phase 2, the environment for calculation is set as the sum of the areas of Sectors B, C, and H. For Phase 3 counterparts, the environment is set as the sum of the areas of Sectors B and H.

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8.2 Statistical Analysis

Two analytical methods are employed – Spearman's correlation coefficient and cluster analysis. The former is aimed at investigating the correlations between grave goods, sex, age, and pathologies. The latter visualizes analytically meaningful grave clusters classified according to the quantity and quality of grave goods.

I conducted both analyses in R Studio and consulted a graduate student, Chang Ching-Yuan, regarding the codes for these functions. He is affiliated with the Department of Agricultural Chemistry and does genetic research with the R language. Together, with partial assistance from Kassambara's (2017) and Carlson's (2017) publications and ChatGPT-4o,[24] we compiled the codes presented in Appendix 1. Let me start by introducing Spearman's correlation coefficient.

8.2.1. Spearman's Correlation (SC) Coefficient

The final burial inventories undergo Spearman's correlation coefficient. Variables that were absent in a given phase are excluded from the analysis.

[24] Chang Ching-Yuan read through the burial inventory for me, pointing out how I should set the quality of the cells on Microsoft Excel for the R Studio to process them. For example, there should not be any N/A texts, and the cells should be set as numeric. He provided his codes for cluster analysis and Spearman's Correlation coefficient to me, and explained to me what every step does within the analytical processes. Where he cannot make himself understood (neither of us have strong statistics background), and when we cannot identify the problem in the codes for SC coefficient that causes its malfunction on my laptop, we asked ChatGPT-4o for explanations and generation of new codes. We gave commands and questions such as "provide the codes for Spearman's Correlation coefficient. Be sure to include codes for the calculation of p-values," "before conducting Spearman's Correlation coefficient, anything about the datasets for caution?" "解釋一下 Hierarchical cluster analysis 的公式怎麼推出來的" (Explain how the formulas of Hierarchical cluster analysis work), "還是看不懂，用圖表再解釋一次！" (Still don't understand. Illustrate again with figures!), and so forth, to the AI tool. The AI tool responded by breaking down each step of the analyses. By persistently interact with the AI tool, we hope to avoid a magical "black box" of analysis.

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There are many approaches to calculating correlations between paired variables. SC coefficient suits datasets that contain a mix of rank, ratio, and ordinal data, or datasets that do not have an approximately normal distribution (Carlson 2017; Drennan 2010). In the final burial inventories, age and sex are ordinal, while the binary pathological data can also be interpreted as ordinal.[25] The grave goods are ratio data,[26] and some of them, such as glass beads and carnelian beads, are far from normally distributed. Therefore, compared to Pearson's correlation coefficient, which is more widely used and is designed for linear data, SC coefficient is a more suitable option.

SC coefficient generates a ρ that ranges from -1 to +1, with the -1 signifying a perfect monotonic association and +1 standing for a perfect negative monotonic correlation. SC coefficient results have to be interpreted with a null hypothesis test. If the p-value is smaller than 0.05, then I can reject the null hypothesis of complete randomness between paired variables (Carlson 2017; LaerdStatistics n.d.).

8.2.2. Cluster Analysis (CA)

I employ CA to segregate the burials according to their differences in grave goods quantity and quality. The type of CA conducted in this research is polythetic agglomerative (or hierarchical). Concisely speaking, this method initially treats each incident, e.g., each burial with a specific quantity of grave goods, as one cluster and compares individual incidents in pairs. If two incidents show similarities, they are

[25] Ordinal data refer to cases where numeric values only indicate relative positions within a sequence. For example, a skeleton whose age is classified as "6" is older than one classified as "4," but the interval between 6 and 4 is not meaningful, as these numbers are mere ordinal codes. Sexual characteristics can also be treated as ordinal because their numeric codes indicate varying degrees of expression, e.g., -1 representing strongly male, -0.5 somewhat male, 0.5 somewhat female, and so forth. Likewise, binary pathological data can be interpreted as ordinal because they stand for differences in extent.

[26] Ratio data contains a true zero point, and have equal intervals. Thus, bead counts and other incident data of the grave goods are ratio.

doi:10.6342/NTU202502709

grouped as a cluster, and the comparison continues until all incidents are grouped into one large cluster. Thus, the number of clusters is not pre-determined, and the analytical result can be illustrated by a dendrogram (Carlson 2017; Tainter 1975).

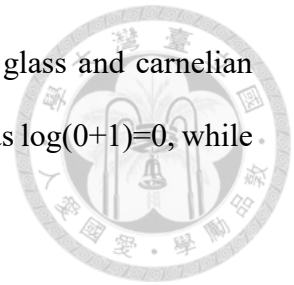
To do this, the CA technique first compresses all attributes into a single distance measure. I use the Gower distance, which is the most suitable calculation method for datasets that consist of a mixture of numeric, dichotomous, and categorical variables, to complete this step (Carlson 2017). Then, the CA technique employs Ward's method to create clusters. This method minimizes the increase in the within-cluster sum of squares, or squared deviations from the mean, and thus maximizes the homogeneity of the clusters (Carlson 2017; Yao 2005).

I use the Elbow method to determine the optimal number of clusters. As mentioned, CA seeks to minimize the within-cluster sum of squares to maximize cluster homogeneity. Thus, the ideal cluster number is the one beyond which adding another cluster no longer significantly reduces the total within-cluster sum of squares. The Elbow method calculates the total within-cluster sum of squares under different numbers of clusters (Kassambara 2017; Thorndike 1953). The method plots the decrease in the total within-cluster sum of squares, and thus visualizes the optimal number of clusters.

Incident data, i.e., grave goods counts, were analyzed. While the data sizes (counts) of most grave goods variables – gold foil items, glass bracelets, glass earrings, and pottery, etc. – are no larger than 10, those of glass and carnelian beads are sometimes enormous, reaching up to over 4,000 in a single burial. In addition, the variance in the numbers of glass and carnelian beads can also be great across the burials – one can contain no beads at all, while another yields over 1,000. I use the log transformation method to address the potential biases resulting from the beads' highly skewed data shapes (Carlson 2017;

doi:10.6342/NTU202502709

Drennan 2010). The method applies a log(x+1) on the columns of glass and carnelian beads during analysis. Graves that have no beads remain unaffected, as log(0+1)=0, while the large counts are compressed.



8.3.Section Summary

In this section, I discuss the spatial and statistical approaches employed in this study to answer my research questions. These questions pertain to the spatial distribution of graves and their characteristics, the correlation between grave goods and skeletal traits (including sex, age, and pathology), and the statistical patterning of grave goods quantities and qualities across the three distinct phases. I use the Average Nearest Neighbor (ANN) to calculate the distribution patterns of burials, and utilize Global Moran's I (GMI) to calculate the distribution patterns of skeletal traits (age and sex). To demarcate burial clusters in the respective chronological phases, I draw buffers by setting the widths at the ANN-observed mean distances between graves. Then, I employ Spearman's correlation (SC) coefficient to detect correlations among sex, age, and grave goods. Finally, I use cluster analysis (CA) to statistically cluster graves that have burial goods of similar quality and quantity. In the next section, I present the analytical results of these tools.

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CHAPTER 9: THE ANALYTICAL RESULTS

This section demonstrates the results of the spatial and statistical analyses of the Average Nearest Neighbor (ANN), Buffering, Global Moran's I (GMI), Spearman's correlation (SC) coefficient, and cluster analysis (CA).

As mentioned in "The Research Methods" section, to approximate the spatial extents and locations of the clusters detected with the ANN tool, which I interpret as consciously constructed and maintained by the Shihsanhang residents, I set the radii (widths) of the buffers for each chronological phase slightly smaller than the mean distances observed by the ANN function. By doing so, I approximate these intervals as the appropriate distances between graves as practiced by the Shihsanhang residents from each chronological phase, and visualize the *estimations* of consciously constructed and maintained burial clusters of the Shihsanhang residents. I present the ANN observed average mean distances between graves from each chronological phase[27] and their detected distribution patterns (dispersed, random, or clustered) in Table 2. I then overlaid the distribution maps of the graves from each phase with marked postures, head orientations, sex, and age with the buffers that I thus drew (Figure 13, Figure 14, and Figure 15 for the locations of graves overlaid with the buffers from Phase 1 to 3; Figure 16, Figure 17, and Figure 18 for the postures of skeletons overlaid with the buffers from Phase 1 to 3; Figure 19, Figure 20, and Figure 21 for the orientations of heads overlaid with the buffers from Phase 1 to 3; Figure 22, Figure 23, and Figure 24 for the distribution of sexed individuals overlaid with the buffers from Phase 1 to 3; Figure 25, Figure 26,

[27] Here, I am referring to Phase 1 (ca. before 1400 cal. B.P.), Phase 2 (ca. 1400-1050 cal. B.P.), and Phase 3 (ca. 1050-550 cal. B.P.) as divided with the relative dating method that I presented in "The Shihsanhang Mortuary Data and Data Processing Methods Employed" section.

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and Figure 27 for the distribution of age overlaid with the buffers from Phase 1 to 3), so as to visualize the relationships of these characteristics with the buffers.

After presenting the distribution of clusters delineated by buffering, which I will subsequently refer to as "spatial clusters,"[28] I examine the distribution patterns of age and sex using GMI to determine whether specific age or sex categories exhibit spatially clustered patterns. The GMI analytical results can be cross-referenced with the distribution maps of the spatial clusters, overlaid with graves from each phase, and marked for sex and age (Figure 22, Figure 23, and Figure 24 for the distribution of sexed individuals from Phase 1 to 3; Figure 25, Figure 26, and Figure 27 for the distribution of age categories from Phase 1 to 3). This is because the maps of sex and age serve as visualizations of the GMI analytical results.

Subsequently, I present the SC matrices and the dendrograms generated by CA for each phase. To clarify the characteristics of clusters classified by CA from each chronological phase, I have numbered them and created Table 7, Table 8, and Table 9. These characteristics include: for Phase 1, *having relatively more beads (37≤x≤93)*, *having one pottery container but low bead counts (x≤4)*, and *having few other grave goods or no grave goods at all*; for Phase 2; *having at least one pottery container*, *having one bronze knife handle*, and *the absence of a pottery container*; and for Phase 3, *BM001 (having limestone beads and one silver foil item and lithic artifacts and 131 carnelian beads)* and *other burials, most without pottery and with bead counts less than 200*. Furthermore, to avoid confusion with the spatial clusters delineated by buffer drawing, I

[28] In opposition to the "statistical clusters" produced by CA.

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refer to the *spatial* clusters as Cluster A, Cluster B, Cluster C, and so forth, and the CA *statistical* clusters as C1, C2, and C3, respectively, in the following paragraphs.

9.1. The Average Nearest Neighbor (ANN) Analytical Results

The ANN analytical results provide answers to Q1 and Q4 of the research questions – how burials are spatially patterned at Shihsanhang, and what kind of temporal differences were present in the spatial distributions. Burials at Shihsanhang always exhibit a clustered pattern across each of the three phases, and these clusters multiply and expand over time, occupying different areas within the site. Table 2 illustrates the observed mean distances and p-values of the ANN for each chronological phase, supporting the conclusion that throughout all three phases, the graves exhibit a clustered pattern. Given that the p-values are significantly smaller than 0.05, I can reject the null hypothesis that the distribution pattern is random. Furthermore, the ANN analytical result also shows a trend of decreasing average distances between burials by approximately 0.5 meters with each successive phase. I believe this pattern is closely related to changes in the relationships between the residents in mortuary contexts, which I will discuss in more detail in the "Discussion" section.

9.2. Buffering Results

As mentioned, I approximate the respective observed mean distances generated by the ANN function as the appropriate distances between graves as practiced by the Shihsanhang residents from each chronological phase. Thus, for the graves from each phase, I set the buffer drawing width slightly smaller than the respective observed mean distances generated by the ANN function. Specifically, I set the buffer width for Phase 1 graves at 3.5 meters, for Phase 2 graves at 2.5 meters, and for Phase 3 graves at 2 meters.

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Figure 13 illustrates the spatial clusters identified in this manner for Phase 1, while Figure 14 and Figure 15 depict the spatial clusters in Phases 2 and 3, respectively.

I delineate the clusters in red and label them in alphabetical order for further discussions. I used alphabetical order to differentiate between spatial clusters and statistical clusters, which were labeled in numerical order. I alphabetically coded the spatial clusters in each phase, in the order of west to east (horizontal) and north to south (vertical). I retain the alphabetical codes assigned to a spatial cluster in a specific phase for consistency in subsequent phases. Should I identify a new cluster, I label it according to the same order – west to east (horizontal) and north to south (vertical). I also label the names of each burial by following the Sector code-M-number system established during the 1990-1992 salvage excavations, as introduced in "The Shihsanhang Mortuary Data and Data Processing Methods Employed" section.

The buffer drawings overlaid with burial locations, marked skeleton postures, and marked head orientations provide partial answers to Q1, Q3, and Q4 – where burial spatial clusters are, how different postures and head orientations are distributed among the clusters, and what temporal differences were present in the spatial distributions of these clusters – as well. The most striking patterns of the clusters' spatial distribution are their increasing size and number, as well as the shifts in the locations where burial clusters are distributed. During Phase 1, only Sector C was used as a burial place, and only four clusters existed. However, during Phase 2, the number of clusters jumps to 21, including those identified in Phase 1. The graves also extend into the large northwestern portion of the site. In Phase 3, most of the new burials contribute to the expansion of older clusters. Only five new clusters were established. Some graves even contribute to cluster merging, as seen in the case of Clusters L and M. In Phase 2, they respectively contained six and

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11 graves; however, in Phase 3, they merged into Cluster LM after five graves were added between them. Thus, in total, there are 25 spatial clusters in Phase 3 (versus four in Phase 1 and 21 in Phase 2).

Notably, during each phase, not all burials belong to a cluster. Table 3 illustrates the counts and percentages of graves from each phase that fall within or outside the identified clusters, taking into consideration the burials from preceding phase(s).[29] In each phase, approximately 20% of the graves are consistently located outside the clusters.

To further visualize the spatial distribution of the skeletons' postures and head orientations, I overlay these variables onto the identified clusters for each phase, thereby producing Figure 16, Figure 17, Figure 18, Figure 19, Figure 20, and Figure 21. I observe that skeletons exhibiting anomalous postures (extended position) and unique head orientations (i.e., directions other than southwest) are not strictly segregated spatially. For instance, in Phase 1, although CM012 is an individual buried in an extended position, it is spatially affiliated with Cluster B (Figure 16). Each spatial cluster also contains one burial with the skeleton's head not oriented southwest (Cluster A contains CM027, Cluster B contains CM012, Cluster C contains CM023, and Cluster D contains CM044) (Figure 19). In Phase 2, BM023 and BM028, two graves that have skeletons in an extended position, comprise Cluster O (Figure 17). On the other hand, Cluster B has three burials with heads oriented northeast (CM004, CM020, and CM021), Cluster E has one double burial with the heads oriented northwest (CM034 and CM035), and Clusters I and J each has one burial with the head oriented northeast (CM053 and CM051, respectively) (Figure 20). In Phase 3, Cluster I consists of two extended individuals whose heads are

[29] Here, the reason graves from the preceding phase(s) of the phase in question are included in the calculation is the same as the rationale for incorporating earlier burials during the ANN analysis and buffer drawing. Burial clusters accumulate through time. Thus, a burial that does not fall within a cluster in a given phase may belong to one in the following phase.

doi:10.6342/NTU202502709

oriented northeast (HM052 and HM055) (Figure 18 and Figure 21). Meanwhile, Cluster H consists of HM071 and HM081, both of whose heads were northeastern-oriented (Figure 21). In addition, Cluster J accommodates HM105, whose head is oriented northwest, and Cluster R contains BM063, whose head is oriented northeast (Figure 18 and Figure 21).[30] Such observations partially answer Q3 and Q4 – how different postures and head orientations are distributed among the clusters, and what temporal differences were present in the spatial distributions of postures and head orientations. Graves with anomalous postures and head orientations both exist within and outside of spatial clusters, and this pattern persisted across the three chronological phases.

9.3. The Global Moran's I (GMI) Analytical Results

The analytical results of GMI straightforwardly answers Q3: the graves at Shihsanhang throughout the three phases are neither arranged by age nor sex.

Table 4 and Table 5 present the GMI analytical results of the skeletal sexual characteristics and ages from each phase. Both sex and age show random distribution, given that the high p-values are higher than 0.05. To further illustrate the spatial distribution of skeletal sexual characteristics in each phase, I add Figure 22, Figure 23, and Figure 24. As for age, I draw Figure 25, Figure 26, and Figure 27. As shown in these figures and supported by spatial analysis, skeletal sex and age at Shihsanhang are randomly distributed in all three phases.

[30] The reason I do not mention Clusters W and X, which both accommodate one burial with the head oriented northeast, lies in my suspicion that these burial clusters were social exclusions instead of consciously maintained cemeteries of communities. This is mentioned in the "Discussion" section.

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9.4. Spearman's Correlation (SC) Matrices

The SC matrices further address Q2, Q3, and Q4 – generally speaking, grave goods quantity and quality, pathologies, sex, and age do not exhibit significant positive correlations throughout the three phases. However, glass and carnelian beads exhibit persistent positive correlations throughout the three phases. Some other traits also show statistically notable correlations in Phase 3, including the squatting facet and osteophyte formation, as well as periosteal reaction and osteophyte formation.

Due to the sheer size of the SC matrices[31] for each phase, I provide Table 6 via Google Sheet. In the p-value matrices, I highlight the values that are lower than 0.05, which indicate that a specific pattern is unlikely to be random. In the correlation matrices, I highlight values greater than 0.5 or less than -0.5 that also have p-values below 0.05. This approach allows me to identify strong positive and negative correlations that are statistically significant.

During Phase 1, statistically significant positive correlations exist only between glass and carnelian beads; pottery containers and bronze vessels; carnelian beads and gold foil items; and carnelian beads and bronze coins. The same kind of correlation also manifests between osteophyte formation and alveolar recession; osteophyte formation and alveolar abscess; and alveolar recession and abscess. Four graves (CM009, CM024, CM027, and CM046) that have carnelian beads yield glass beads as well. Meanwhile, two out of three graves (CM024, CM027, and CM036) that have gold foil items yield carnelian beads. Only one grave (CM018) has a bronze vessel, while one individual (CM050) is diagnosed with osteophyte formation, alveolar abscess, and alveolar

[31] The reason some of the cells in the correlation and p-value matrices are blank is that one of the paired variables represented lacks data, making the correlation incalculable.

doi:10.6342/NTU202502709

recession at the same time. Thus, except for the correlation between glass and carnelian beads, while all the mentioned variables may show *statistically* significant correlating relationships, I am cautious about the *interpretative* potential of these correlations, as cases that contain these variables are few.

During Phase 2, statistically significant positive correlations are observed between glass and carnelian beads, bronze plaque and coins, bronze spoon and alveolar abscess, and whetstone and fracture. Glass beads were concomitantly unearthed in 29 out of 36 graves that yielded carnelian beads.[32] However, only one bronze plaque and a spoon were discovered, and they were located in separate graves (BM062 for the bronze plaque and BM035 for the spoon). Meanwhile, only one individual – HM126 – had suffered a fracture, and this grave yielded one of the only two whetstones from this phase. As in Phase 1, except for the correlation between glass and carnelian beads, I am cautious about the interpretative potential of all the mentioned positive correlations, given the small sample size.

During Phase 3, positive correlation that has statistical significance exists between glass and carnelian beads, limestone beads and lithic artifacts, limestone beads and silver foil items, silver foil items and lithic artifacts, bronze fragments and lithic flakes, squatting facet and osteophyte formation, squatting facet and alveolar recession, and periosteal reaction and osteophyte formation. All of the eleven graves that contain carnelian beads (BM001, BM005, BM045, HM011, HM052, HM055, HM082, HM086, HM090, HM105, and HM119) concomitantly yield glass beads. Only one grave – BM001 – yields limestone beads and lithic artifacts, and the only silver foil item during this phase

[32] The 29 graves are: BM017, BM025, BM030, BM035, BM049, BM062, CM001, CM004, CM021, CM029, HM004, HM007, HM013, HM015, HM022, HM044, HM045, HM053, HM062, HM068, HM079, HM091, HM114, HM117, HM118, HM121, HM123, and HM124.

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also comes from this grave. Two graves (BM083 and HM119) yield bronze fragments, and one of them also contains a flake. Every individual (BM070, BM072, HM040, HM041, and HM071) diagnosed with a squatting facet is also diagnosed with osteophyte formation. Meanwhile, there are only two cases (BM070 and BM072) of alveolar recession, and both are associated with the squatting facet. Lastly, among the ten individuals (BM070, BM086, HM011, HM030, HM040, HM041, HM047, HM052, HM116, and HM119) diagnosed with periosteal reaction, only two (HM052 and HM119) are not diagnosed with osteophyte formation. To be concise, the positive correlations found (in a limited number of individuals) between squatting facet and osteophyte formation, as well as periosteal reaction and osteophyte formation, stem from a larger sample size compared to preceding phases. Similarly, the correlation between glass and carnelian beads is also based on a bigger sample size, in contrast with Phases 1 and 2. Finally, BM001's uniqueness is notable, and CA also detects it. I will now move on to the CA analytical results.

9.5. The Cluster Analysis (CA) Analytical Results

Supplementing the SC matrices, the CA dendrograms provide the answer to Q2 – what differences in grave goods quantity and quality exist among burials. During each phase, some grave goods, primarily pottery, glass and carnelian beads, and bronze knife handles, are unevenly distributed as detected by CA, indicating different mortuary practices that involve distinct decisions or tendencies. I will delve deeper into this in the Discussion, but for now, I showcase the analytical results of CA.

Figure 28 illustrates the optimal number of clusters in Phase 1. Recall that the Elbow method defines the optimal cluster number as the one beyond which adding another cluster no longer significantly reduces the total within-cluster sum of squares

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(Kassambara 2017; Thorndike 1953). In Figure 28, the difference between the within-cluster sums of squares at k=1 and k=2 is approximately 45, while that between k = 2 and k = 3 is approximately 20. However, the difference between the within-cluster sums of squares at k = 3 and k = 4 drops within 10 and continues to slope gently downward as the k value increases. Thus, I know that the elbow point is three. Accordingly, I set k as 3 in the coding language that generates the dendrogram (#Step 7 in Appendix 1-2) to highlight the three statistically significant clusters with red rectangles (Figure 29).

Additionally, Table 7 presents the characteristics of each cluster. In Phase 1, the graves from C1 (n=3) are characterized by relatively larger numbers of beads compared to the other Phase 1 burials. These burials contain over 30 and up to 93 glass beads, and yield over four but not exceeding ten carnelian beads. Both burials from C2 (n=2) have only one pottery container and a bead count of fewer than five. The remaining burials in C3 (n=20) have few to no grave goods, and they yield no pottery containers, while their bead counts never exceed seven. Meanwhile, CM009 from C3 contains one bronze knife handle. In the “Discussion” section, I will explain why knife handles are worthy of attention.

Figure 30 demonstrates the spatial distribution of C1, C2, and C3 during Phase 1. Spatially speaking, Cluster C boasts the most remarkable diversity, as it comprises burials from all three of these clusters (C1, C2, and C3) identified by CA. As for the rest of the spatial clusters, while Cluster A consists of one grave from C1, Clusters B and D both comprise C3 graves. Notably, CM009 is located outside of the spatial clusters. These patterns suggest differences in mortuary practices, which I will discuss in more detail in the “Discussion” section.

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Now, I will move on to Phase 2. Figure 31 plots the within-cluster sums of squares when k is set differently. In Phase 2, the difference between the within-cluster sums of squares at k=1 and k=2 is approximately 550, while that between k=2 and k=3 is approximately 100. From k=3 to k=4, the difference of the within-cluster sums of squares is also 100, and then the curve slopes gently downward as the k value increases. Thus, I know that the elbow point, namely, the optimal number of clusters, is again three. I subsequently highlight what these three statistically significant clusters should be using red rectangles in Figure 32.

Additionally, Table 8 presents the characteristics of each statistical cluster in Phase 2. Graves in C1 (n=56) from Phase 2 are characterized by having at least one pottery container, while graves in C3 (n=94) have no ceramics at all. There are exceptions to these characterizations within these two clusters, though. C1 includes one burial (HM117) without ceramics, while C3 contains two graves with pottery (CM004 and HM072). Finally, each grave in C2 (n=6) contains one knife handle, and HM019, HM022, and HM083 in C2 each yield one pottery container.

The spatial distribution of the statistical clusters shows a specific range of diversity (Figure 33 and Figure 34). In Clusters B, C, D, E, F, G, J, M, N, O, Q, R, and U, the number of graves from C3 exceeds the number of burials from C1. However, in Clusters I, K, L, S, and T, C3 burials outnumber C1 burials. Meanwhile, five of the C2 graves are scattered in separate spatial clusters (Clusters H, L, M, P, and R), while one falls outside of all spatial clusters.

Finally, Figure 35 presents the optimal number of clusters in Phase 3, which is 2. The difference between the within-cluster sums of squares when k=1 and k=2 is approximately 4,000, while that between k=2 and k=3 is nearly 100. The curve does not

doi:10.6342/NTU202502709

show significant fluctuation thereafter. Thus, the elbow point, or the optimal number of clusters, is two.

Figure 36 illustrates the clustering dendrogram divided according to the elbow point, and Table 9 presents the characteristics of the statistical clusters. According to the figure and table, C1 (n=1) in Phase 3 consists solely of BM001, whose peculiarity is also detected by the SC coefficient. Burial goods such as limestone beads and silver foil items are unique to this grave and have not been discovered elsewhere at the Shihsanhang site before. Carnelian beads, which have become quite scarce in mortuary contexts in this phase compared to previous periods, are found in a relatively large number (273) in BM001. On the other hand, C2 (n=74), characterized chiefly by no pottery container (except for BM005, BM015, BM047, BM053, BM083, BM092, and HM104) and bead counts fewer than two hundred, made up the majority of Phase 3 graves. Compared to Phase 2, the use of ceramics as burial goods appears to have fallen out of trend. I further illustrate the spatial distribution of the graves assigned to different CA clusters in Phase 3 with Figure 37 and Figure 38. As can be seen, BM001 is located in Cluster X, a phenomenon that I will articulate in the “Discussion” section.

9.6.Section Summary

In this section, I outline the significant analytical results via Average Nearest Neighbor (ANN), Buffering, Global Moran’s I (GMI), Spearman’s correlation (SC) coefficient, and cluster analysis (CA). The Shihsanhang burials exhibit clustering distribution patterns across the three phases, as well as fluctuations in grave numbers and changes in interment locations. Within each phase, approximately 20% of the burials deviate from the general trend of spatial clustering. Furthermore, while numerous grave goods, sex, age, and pathologies do not appear to correlate with each other except during

doi:10.6342/NTU202502709

Phase 3, grave goods such as ceramics, glass beads, and knife handles were not evenly distributed among the spatial clusters. Instead, as statistically demonstrated, I found these three kinds of grave goods in fluctuating amounts across the spatial clusters of burials – some clusters contain graves that have relatively more beads, or more burials that yield ceramics or knife handles, while others do not. The graves also do not seem to be organized around factors related to sex and age, and anomalous postures are not necessarily correlated with being a spatial outlier. Now, one issue awaits addressment – what do these phenomena and patterns socially involve and realize?

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CHAPTER 10: DISCUSSION

According to the Global Moran's I (GMI) analytical results and Spearman's correlation (SC) matrices, throughout the three chronological phases I defined, the graves were not spatially organized according to differences in age or sex.[33] Nor was any category of grave goods, generally speaking, strictly associated with another or with specific age, sex, or pathological traits. I also have not been able to identify distinct groups of burials containing identical quantities and qualities of grave goods: this seems to indicate that rigid regulations concerning the use of specific quantities or kinds of grave goods were not in place at Shihsanhang. It seems fair to say that at Shihsanhang, the selection of burial location and placement of grave goods was relatively *ad hoc*, in the sense that cemeteries and grave goods do not appear to be contingent on the principal axes – age and sex – of individual identity as defined by past anthropologists (Binford 1971; Peebles and Kus 1977; van Gennep 1960).[34]

Now, I will return to the research questions: How were the Shihsanhang residents, both human and non-human, related to each other? If a settlement is not a self-evident social unit, what kind of social entities larger than each individual member should I reconstruct Shihsanhang as accommodating? What exactly was put into practice to assemble these social entities, and what were the relations between them? How can I

[33] I do notice that infant graves are entirely absent across the three phases. This may indicate that a different location for interment or other forms of mortuary treatment were done for infants.

[34] In his hallmark article *Mortuary Practices: Their Study and Their Potential*, Binford (1971) cites Goodenough's (1965) concept of the social persona and argue that age and sex are "the primary dimensions…given recognition in differential mortuary treatment" (Binford 1971:17). Meanwhile, Peebles and Kus (1977) divide social persona into the superordinate and subordinate dimensions. The former dimension is related to ascribed status, where "some infants and children will have greater amounts of energy expended on their mortuary ritual than some adults; in the same manner some women will be ranked higher than some men and will share status-specific symbols with some men" (Peebles and Kus 1977:431). The latter dimension is related to achieved status, where given features such as age and sex determine the mortuary treatment of an individual. For van Gennep (1960), that funerary rites are associated with the dead's age and sex is something that "everyone knows" (van Gennep 1960:146).

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address these questions by investigating the people and things related to death – graves, burial goods, skeletons, and mourners, etc., at Shihsanhang? Before I delve into the analytical results of each chronological phase to discuss these issues in more detail, let me first recall the theoretical grounds of this thesis and connect them with Shihsanhang.

10.1.From Assemblage Theory to Shihsanhang

To begin with, this thesis employs the concept of *assemblage*. An assemblage is an entity marshalled from different-natured components (both human and non-human) through historical processes and acquires identities through the interactions between these parts (Bennett 2010; DeLanda 2006). The verb "to assemble" thus describes the process of putting together human and non-human components that possess distinct properties into a working compound involving an identity and internal cohesiveness. An assemblage is not a systematic totality in the sense that every component is not explained in terms of its function in maintaining the existence of the whole system (Shanks and Tilley 1987), so that the properties of components do not solely stem from the *linear causality* between components. Instead, human and non-human components enter *contingently obligatory encounters* with each other, in which they become related to each other by releasing *capacities* that stem from the components' own properties (after DeLanda 2006), as in the case of the pollinating bee mentioned in the "Theoretical Background" section (DeLanda 2006). Conversely, components can potentially join or drop out of an assemblage over time without altering their properties. Thinking this way opens up a different conceptualization of the ontology of the social. Whereas advocates of systems theory emphasize cybernetic co-functioning and equilibrium, those who champion assemblage theory stress openness, heterogeneity, and precarity constituted via historical processes (DeLanda 2006; Tsing 2015).

doi:10.6342/NTU202502709

Since assemblages are defined by the numerous encounters between humans and non-humans in which different capacities are released, they can expand endlessly. Therefore, one needs to specify the *scale* under discussion and at which an assemblage acquires a specific *identity*. The term *territorialization*, defined in the "Theoretical Background" section, describes the creation and stabilization of this identity through capacity release at a particular scale. Territorialization comprises two dimensions, one *spatial* and the other related to *recurrent practices*, with both intimately related to the assemblage's internal cohesiveness (DeLanda 2006). However, since components can potentially exit an assemblage, this identity can change over time or be overthrown, a process known as *deterritorialization* (DeLanda 2006, 2016). The identity also acts as a source of limitations and opportunities for its components.

To exemplify, recall the Tayal and Bunun ethnographic analogies discussed in the "Theoretical Background" section – a family occupied a spatial locus by living in a house and maintaining a bounded indoor cemetery (王梅霞 2006; 黃應貴 2012). The family did not merely occupy an objective space to exist; instead, through house construction and inhumation, they form a landscape of *relatedness* (Carsten 1995) mutually constructed by the living, the house, and the deceased (after Ingold 1993). A family would also engage in recurrent practices to maintain internal cohesiveness, such as sharing millet from the same garner, exchanging pork, and burying the dead under their house, among others (for specific examples, see 王梅霞 2006; 達少 and 歐嗨 2021; 馬淵東一 2017; 黃應貴 2012). Here, territorialization processes – the construction of landscapes and the recurrent practices – stabilize the identity of the Tayal or Bunun family. Within this process, humans and non-humans engage in a variety of capacity releasing: the stone slabs release their capacity of accommodation from their stiffness when built into a house; the

doi:10.6342/NTU202502709

living humans exert their capacity to act when they eat, build, and inhumate; the millet release their capacity of the mutuality of being, i.e., constituting a shared substance among family members, during the millets' encounters with people (after Sahlins 2013) . Conversely, a breach in the territorialized identity, e.g., refusal to eat from the same garner or engage in pork exchange, would be gossiped about and frowned upon, thereby acting as a source of both limitations and opportunities for its components (馬淵東一 2017).

The requirement to specify scale also indicates that one can study assemblages in a multi-scalar manner. Therefore, one can also analyze the landscape-making and recurrent practices of the Tayal and Bunun that put small families together into a larger kin group. For example, persistently adhering to specific marriage taboos, forming house clusters, and attending the same church would all be territorialization processes for a larger assemblage (kin group) consisting of smaller assemblages (families) (王梅霞 2006; 馬淵東一 2017; 黃應貴 2012). In other words, one can trace the mentioned variety of capacity release through multi-scalar means to study assemblages at different scales.

As stated in the "Theoretical Background" section, in this study, I employ the concept of community to specify the scale of assemblage in discussion empirically. I define a community as an assemblage larger than an individual grave, namely, involving multiple graves and other humans and non-humans, but smaller than the whole Shihsanhang settlement site (after Harris 2014b). Smaller than the *communal level* is the *individual level*, represented by a given individual grave, which was itself an assemblage of a deceased person, some (or no) grave goods, and the mourners who arranged the funeral. Conversely, to describe a scale larger than a community, I use the term "*cross-community*," which refers to the scale of the Shihsanhang site as a whole. These three relative scales are what I can identify through the mortuary data, and as follows, I explain

doi:10.6342/NTU202502709

how I recognize a community – the reference point of the individual and cross-community scales – among the Shihsanhang graves.

To demarcate and study communities at Shihsanhang through burials, as discussed in the "Research Question" section, I cite Goldstein's (1981) revision of Saxe's (1970) generalization on the correlation between corporate groups and bounded, maintained cemeteries. According to the analytical results, the graves at Shihsanhang are conspicuously clustered, forming cemeteries with distinct boundaries that have been maintained over hundreds of years. I consider these cemeteries as "bounded area[s] for the exclusive disposal of [some] group[s'] dead" as defined by Saxe (1970) and Goldstein (1981). Thus, I speculate that corporate groups, organized around kinship and probably involved in resource control – perhaps, control over access to foreign goods or iron production – were likely maintaining the cemeteries.[35]

My employment of this approach is also backed by my research in the past (Zhang 2023), and assisted by ethnohistorical texts illustrating the spatial correlation between domestic structures and residential burial clusters among the Tamsui Aborigines, which likely indicates that some social unit was behind the maintenance of residential cemeteries and could be inferred from them. In addition, Father Esquivel used the word *partidos* to describe one of the social units of the Tamsui Aborigines (Borao Mateo 2001:181). According to Hispanio-Philippine terminology, the word denotes "an association of family clans headed by the principals (chiefs), or *bagui*" (Borao Mateo 1993). I thus highly suspect that social entities of the like maintained the residential cemeteries identified in this study. Furthermore, since Father Esquivel recorded that "[t]he influential

[35] I fully recognize that to investigate how the Shihsanhang communities control resources or confirm whether they control resources or not requires multiple lines of evidence.

doi:10.6342/NTU202502709

folk are those who have the most stones, ceramic jars, clothes and corn stock" (Borao Mateo 2001:182), I even suspect that some of the graves containing relatively large amount of burial goods belonged to the "principals," or any important figure who probably "headed" a community in whatever ways.

By using the word "community" instead of "corporate group" to emphasize the constructive nature of social groups, I subsequently describe how the identities of the Shihsanhang communities were territorialized via practices. Let us first revisit the fact that at Shihsanhang, grave clusters were constructed within residential areas, and some were even directly associated with domestic structures (Zhang 2023). Tying these patterns to the Tayal and Bunun ethnographic analogies, I propose that when the Shihsanhang residents recurrently practiced mortuary rites, they were transforming the place they dwelt in into a landscape of relatedness, within which artifacts, living community members, and the deceased would be involved in capacity release. The recurrent practices and landscape-making constituted the territorialization of Shihsanhang communities.

The capacities released by grave goods, living community members, and the deceased require further articulation. As discussed in the "Theoretical Background" section, interring the dead in residential areas is an ancestralizing practice that keeps the deceased community members "here" in the residential-cum-mortuary landscape (Sahlins 2022). Based on this interpretation, I argue that "being here" was a capacity of the dead, the dialectical capacity of maintaining memberships within living communities. Here, the capacity of "being here" is dialectical in the sense that the living interred the dead to retain the deceased's tie to the community, and thus created a landscape of relatedness. The community territorialized and derived its identity through constructing this landscape, and such an identity then shaped the membership of its human components. Seen from

doi:10.6342/NTU202502709

this vantage point, the living and the dead were mutually constructive of community identity.

In turn, let me elaborate on the capacities of grave goods with the assistance of ethnohistorical texts on the Tamsui Aborigines. I focus on their use of glass beads and ceramics, which are, at Shihsanhang, important types of burial goods identified by cluster analysis (CA). By doing so, I am tying these ethnohistorical analogies to the Shihsanhang residents. According to texts from the Spanish and Qing Colonial Eras, beads mediated a full range of social activities among the Tamsui Aborigines. Both Jesuit Father Jacinto Esquivel (Borao Mateo 2001:179) and Huang (黃叔璥, et al. 2021[1722]) noticed that "[people] were engaged at their youth by using beads with the help of matchmakers" (黃叔璥, et al. 2021[1722]).[36] Father Esquivel recorded that if a person was given to the "vices of the flesh," "the accused must pay one of these stones (sic) or *cuentas* to the one who caught him" (Borao Mateo 2001:179), with "stones" referring to glass and carnelian beads (Borao Mateo 1993). Father Esquivel also witnessed mothers giving infants away "in exchange for stones, clothing material, and *carayo*" (Borao Mateo 2001:179). In addition, Father Esquivel noted that people stole beads from each other, for "the [more coveted] objects [were] the stones" (Borao Mateo 2001:182), and that "[t]he influential folk are those who have the most stones, ceramic jars, clothes and corn stock," who are also the most outstanding headhunters (Borao Mateo 2001:182). During the Qing Colonial Era, glass and carnelian were even used as currency by the Aborigines from the Taipei Basin for leasing farmland (高賢治 2003).[37]

[36] The original text reads, "自幼倩媒以珠粒為定" (黃叔璥 et al. 2021[1722]). Translation mine.
[37] For example, in 1739, a folk land contract recorded the use of "savage beads." The original text reads as follows:

doi:10.6342/NTU202502709

We can now envisage how to "assemble" people with beads or pottery, thus producing communities' identities. The properties of beads and pottery – perhaps their colors, sequences, sizes, shapes, or histories of manufacture or circulation, among other dimensions valued by Taiwanese Austronesian-speaking groups known ethnographically (張光仁 2012; 胡家瑜 2012) – constituted these items' capacity to mediate marriage-making, fines and debt settlement, infant-related reciprocity, wealth accumulation, and the payment for resources such as land, among others.[38] The artifacts would thus relate individuals to one another through the release of *mediatory capacity* (after DeLanda 2006; Latour 2005) during their encounters, forming a working compound of beads/ceramics and people. This assemblage would generate and sustain identities concerning prestige or kinship, among others indicated in the texts.

Henceforth, I interpret that when Shihsanhang mourners brandished beads and ceramic containers during funerary rites and interred them with the deceased individual, they were also demonstrating the extent of the mediatory capacity exercised either by the deceased individual or the mourners themselves (Graeber 1996). In addition to demonstrating the controlled mediatory capacity, such displays were also *mnemonic* (after Rowlands 1993). Although it is difficult to determine who, or how many, participated in a given mortuary rite, I may suppose that community members participated in funerals held within their own group (Tsang 2010 [2002]). By allowing participants in such

Bulegwan savages Bena, Noban, and Tabuyoq have recruited Han settler Lim Tieng-No to reclaim two plots of land located in Pai Tsiap District, Buat Gam E Liu Tshiu Lam. The boundaries of the plots are clearly demarcated, and a tenancy payment of 35 savage beads Kanokung was received (高治賢 2003, translation mine).

武勞灣番買那、老萬、嗒母約。招得漢人林騰老，前來開墾擺接里末坎下柳樹滴犁分貳張，四至明白為界。時收犁頭銀，即番珠咬老廣共參拾伍粒正（高治賢 2003）。

According to Japanese ethnologist Ino Kanori's field notes, the Aborigines in the Taipei Basin referred to glass and carnelian beads as *kanogun* (胡家瑜 2012). I received this text via email from Professor Chen Chih-hao, who is based at the Graduate Institute of Taiwan History, National Taiwan Normal University.

[38] The fact that glass and carnelian beads correlate with each other throughout the three phases, as demonstrated by the SC matrices, suggest that these two kinds of ornaments were engaged in very similar social contexts.

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funerary rites to witness the burial goods with the corpse, the members constructed memories of the mediatory capacity that the artifact(s) embodied, which were reserved solely for the participating community members (Joyce 2003). To sum up, the capacity of beads and ceramic containers within mortuary contexts was multi-dimensional: exhibitions of grave goods with the dead activated mediatory and mnemonic capacities, which are two sides of the same coin.

Finally, given that encounters between components were contingently obligatory, involving their joining in and dropping out of assemblages over time,[39] different assemblage-cum-communities likely have distinct territorialization trajectories, making the communities distinct from one another to varying degrees (after DeLanda 2006). As mentioned in the "Theoretical Background" section, this brings historical tracing into the picture. Despite the temporal flow of before and after in capacity release, the historical tracing here treats the Shihsanhang residents' mortuary practices as embodying a past in the present and as projecting toward future similar practices (after Hamilakis 2017; Ingold 1993; Yao 2016). I thus suggest that when the Shihsanhang residents buried the dead "here" (Sahlins 2022) within residential areas and created specific memories of grave goods and the interred individuals, they were also preserving a person's past existence within the present of the living, which, as previously stated, shaped the identity of community members in the future. By scrutinizing the patterns and changes of mortuary practices over the three chronological phases, I am not only observing the patterns and changes on

[39] Beads, pottery, and the deceased could drop out of one assemblage and enter into another through history. Nowadays, people have ceased using beads during farmland leasing, nor has anybody persisted on practicing residential burial at Shihsanhang. As yet, a new group of people called anthropologists has stored many beads, pottery, and human bones within research institutes – a new assemblage involving new contingently obligatory encounters.

doi:10.6342/NTU202502709

a timeline, but also embedding them in the concept of the reenactment of a past in the present projected toward the future.

I hope to have highlighted the difference between my theoretical stance and that of those following a systems ontological approach, such as that employed by Tsang (2010[2002]). In a system, the intimate and sophisticated practical encounters between people and things are reified as the cybernetic co-functioning, or mechanical inputs and outputs, of sub-systems (Shanks and Tilley 1987). In systems theory, humans and non-humans are not practically constructing or living the social either, given that they are situated outside of the social as the social is considered "an artefact which mediates between [a human] himself and the world of nature" (Renfrew 2021[1972]:94). In other words, people only perform "behaviors" that do not require articulations beyond adaptational goals (Pauketat 2001; Shanks and Tilley 1987). These postulations – cybernetic co-functioning, systematic equilibrium, and adaptational behaviors – are what the assemblage is set against; the concept of assemblage attempts to open a window to the heterogeneity, practices, history, precarity, and openness of the social, framed within the interactions between humans and non-humans.

I thus suggest that we can employ the assemblage approach to more accurately characterize Shihsanhang than the past systems approach has. This is because, rather than one systematic social entity operating according to functional mechanisms or norms, Shihsanhang appears to be assembled – or, to rephrase – to be gathered from many heterogeneous communities into a dynamic whole more than the sum of these communities. Each community appears to practice mortuary rites that are somewhat distinct from one another, as indicated by the uneven distribution of grave goods. In addition, while cluster-making was the norm, approximately 20% of graves are

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consistently located outside of clusters calculated using the ANN-observed mean distances throughout the three phases. Some of them are interred with an abundance of grave goods, just like some of those within clusters. All of these patterns support the interpretation I put forth: Rather than a mechanistic system where subsystems operate to achieve equilibrium, Shihsanhang resembles an assemblage of distinct, smaller communities, each an assemblage *sui generis* and implementing rather heterogeneous territorialization activities. In short, Shihsanhang is an assemblage of assemblages that accommodated some extent of non-uniformity or standouts.

I would also like to argue that although Shihsanhang is assembled from several smaller communities, cross-community identity also existed. This can be seen in the fact that, despite each community practicing somewhat different mortuary rites, they still adhered to a common funerary custom: While some communities tend to include pottery containers, beads, or knife handles in specific graves and others do not, over time, the majority of the Shihsanhang residents primarily buried the dead in a flexed position with the head oriented southwest. Throughout the three phases, burial clusters based on the ANN-observed mean distances and buffering also tend to retain spatial separation, suggesting that the demarcation of communities are complied with and maintained cross-communally.[40] To wrap up, while people and things were assembled into communities of varying sizes and characteristics, they consistently demonstrate a limitation in the degree of the variance in mortuary customs, and this limitation constituted the territorialization of Shihsanhang as a larger assemblage.

[40] Indeed, this may result from the method that I adopted for cluster drawing – to set the buffer widths at the ANN observed mean distances.

doi:10.6342/NTU202502709

Now, let me elaborate on these assertions concerning each phase in detail based on the analytical results.

10.2.Phase 1

Phase 1 was the initial territorialization period of the Shihsanhang residents. Compared to the later phases, the population size in this phase was smaller, and communities were more loosely held together, as actualized in a wider ANN-detected mean distance between burials. In addition, while the quantity and quality of grave goods varied among the graves, these distinctions were not as pronounced as those among Phase 2 and Phase 3 graves. These patterns suggest that, during Phase 1, the Shihsanhang residents began practicing specific means of territorialization, some of which would be intensified in subsequent periods. These means include: putting relatedness into practice by interring the dead closely with one another; placing artifacts within graves during funerary rites to engender particular memories reserved to participants; maintaining spatial boundaries between grave clusters to demarcate communities; and burying the dead in a flexed position with the head oriented southwest.

As can be seen in the grave goods clustering dendrogram (Figure 29) and the CA cluster distribution map of Phase 1 (Figure 30), the funerary rites involving grave goods varied across Clusters A, B, C, and D. As mentioned earlier, Cluster C exhibited the greatest diversity of grave goods clusters, as detected by CA. CM018 yielded a pottery container,[41] and CM024 and CM046 contained comparatively more glass beads (87 in the former and 33 in the latter) and carnelian beads (four in the former and nine in the latter).[42]

[41] The pottery container was a jar, located about 40 cm southwest to the femur of CM018 – all that were left for the skeleton.
[42] The beads of CM024 and CM046 revealed in a bunch, and teeth fragments were found within. It is thus hard to tell if the beads were worn as bodily ornaments or placed adjacent the bodies.

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This resonates with Cluster A, where CM027 was also buried with a pottery container and 93 beads.[43] Clusters A and C, however, stand in stark contrast to Clusters B and D, as they contained no ceramic artifacts, and none of their graves' bead counts exceed seven. These patterns suggest that across the communities in Phase 1, territorialization trajectories varied somewhat.

In addition, two graves in particular attract my attention and warrant further elaboration – CM009 and CM016. The former contained one knife handle,[44] and the latter yielded one ceramic container.[45] The characteristic shared by these two graves is that they were both interred outside of clusters identified with the ANN observed mean distance between Phase 1 graves.

Bronze knife handles are believed to embody healing, spiritual, or cosmic powers (陳光祖 2011) by the Taiwanese Austronesian-speaking people. According to ethnographic texts regarding the Aborigines from the Hsingang Tribe in Hsinchu, northwestern Taiwan, documented by Japanese ethnologist Nobuto Miyamoto (宮本延人 1949, as cited in 陳光祖 2011), similar bronze artifacts were regarded as *tailau balaki*, i.e., the legacy of their ancestors. The Hsingang Aborigines knew these knife handles were grave goods from the past. When someone fell ill, they would excavate the knife handles and rub them against the patient's skin to alleviate the ailment. Ten years after Nobuto's fieldwork, Japanese archaeologist Kokubu Naoichi (國分直一 1949, as cited in 陳光祖 2011) revisited the Hsingang Tribe and recorded elders' accounts that red-slipped

[43] In CM027, the beads were scattered adjacent to the ceramic jar, which as a whole was located approximately 20 cm northeast from the cranium.
[44] Two teeth were all that were left for the skeleton of CM009. The knife handle was discovered with the teeth.
[45] The ceramic container was located to the northwest of the cranium. They were approximately 30cm apart.

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ceramic jars containing such knife handles had been unearthed in farmland. Kokubu concluded that these knife handles had once been possessed by individuals who either performed healing skills or were endowed with spiritual powers (國分直一 1949, as cited in 陳光祖 2011). Meanwhile, until recent decades, the Paiwan people of southern Taiwan continued to possess morphologically similar bronze knife handles. The Paiwan referred to these objects as "the crane of the god of the cosmos" (順益台灣原住民博物館 n.d.), an artifact of divine origin, which was used by shamanic figures and heirloomed. Ethnohistorically speaking, Father Jacinto Esquivel also noted "sorceresses who [spoke] with the devil" (Borao Mateo 2001:180), i.e., women who performed spirit-fending rites and oversaw feasts involving alcoholic beverages. Spiritual, healing, or cosmic – in the following paragraphs, I refer to the powers embodied in the ethnographically recorded bronze knife handles as "shamanic" in general. I thus wonder: could the knife handles found at Shihsanhang be wielded by persons endowed with shamanic power?

Why were the graves that yielded a knife handle and a pottery container situated outside of burial clusters? I propose three suspicions: First, the individual buried with the knife handle may have exercised shamanic power during their lifetime and been unique among the communities. Thus, their grave was spatially segregated from the communal cemeteries at death. By excluding some individuals from communal cemeteries, the communities territorialized by reaffirming who belonged to the group, thereby facilitating internal cohesion. Second, the fission of communities occurred, and CM009 and CM016 departed from the communities to which they had initially belonged, contributing to their spatial separation from the communal cemeteries.[46] Finally, this could also probably be a

[46] As mentioned, grave clusters at Shihsanhang are spatially associated with domestic structures. Thus, to talk about the fission of communities, I will also have to investigate structural remains, primarily postholes. Admittedly, my research elsewhere (Zhang 2023) does not present strong evidence of communal fission,

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mere result of the inaccuracy of cluster drawing, as they were incorporated into Cluster B in Phase 2. After all, the GIS analytical results are *estimations*, not direct measurements of human activities themselves.

I also believe that the other outliers of the mainstream mortuary treatment, in terms of location, posture, and head orientation, are worth attention. I will start with locational outliers: There are seven such graves during Phase 1, including CM009 and CM016. The others are CM006, CM036, CM048, CM051, and CM052. CM006, CM009, and CM0016 were incorporated into Cluster B in Phase 2, and CM036 formed Cluster E in Phase 2 with new graves, probably indicating community fission. However, CM048, CM051, and CM052 were never affiliated with any community.

The only outlier in posture is CM012, and those in head orientation include CM012, CM023, CM027, and CM044. Rather than being spatially excluded from burial clusters and devoid of mortuary artifacts, some are affiliated with distinct communities and contain burial goods. For instance, although, according to Figure 19, CM027's head is oriented northwest, it was buried with a pottery jar and affiliated with Cluster A. The head of CM044 is oriented northeast, and it is spatially affiliated with Cluster C.[47] These patterns suggest that among the Phase 1 graves, deviations from the Shihsanhang mainstream mortuary customs existed, and some communities incorporated these

yet that research encountered many limits, including coarse chronological resolution and selecting only one sector (Sector H) of the site for analysis. Looking forward to more fine-grained dating results and expanding the sample size, I hope to cross-reference mortuary and structural remains to verify the probability of communal fission in future studies.

[47] The reason the other outliers in terms of head orientation – CM012 and CM023 – were not discussed is that their head orientations resulted from postmortem disturbance. According to the field notes, CM012 had been heavily disturbed by "later human activities," while only some fragments of the femurs and cranium were remained for CM023.

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deviations, likely according to the deceased's social status during their lifetime or the circumstances of death – a determination that is difficult to make.[48]

10.3.Phase 2

In Phase 2, intensive territorialization occurred. More specifically, the number of communities increased dramatically, and the mean distance between graves, as calculated by the ANN tool, also decreased by 1 meter, reaching 2.5 meters. The cemeteries also expanded into the northwestern portion of the site, while older spatial clusters persisted. Additionally, the number of individuals buried with beads and pottery containers, as well as the number of beads used as grave goods, both increased significantly. These patterns suggest that new forms of territorialization, based on and intensifying pre-existing mortuary practices, happened.

Examining the grave goods clustering dendrogram (Figure 32) and the spatial distribution of the CA clusters (Figure 33 and Figure 34) in Phase 2, the first notable discovery is that pottery use increased significantly. In Phase 1, three out of 25 graves – 12% – contained ceramic containers. However, in stark contrast, 61 out of 156 graves – 39% – included pottery in Phase 2. Despite this striking difference, not every grave cluster was inclined to place ceramic containers within burials. As mentioned in the previous section, in Clusters B, C, D, E, F, G, J, M, N, O, Q, R, and U, the number of graves without pottery exceeds the number of those with pottery. However, in Clusters I, K, L, S, and T,

[48] According to ethnographic texts (王梅霞 2006; 黃應貴 2012; 楊淑媛 2007) many Taiwanese Indigenous groups, past and present, accord distinct mortuary customs to individuals who died "fortunately" or "unfortunately." For example, both the Tayal and Bunun believe that to die from sickness in one's own house is fortunate, and such individuals' funerals are participated in by house members. In contrast, to die from headhunts, falling, obstructed labor, or car crash are deemed "unfortunate." These individuals are either buried at the location of death, left unattended at the site of death, or removed from houses as soon as possible. People are also afraid to attend such individuals' funerals. It is highly probable, I believe, that similar customs existed among the Shihsanhang people.

doi:10.6342/NTU202502709

the opposite is true. Building on the earlier practice of territorialization involving pottery, some communities were more inclined to include pottery in their burials, while others were not, constituting distinct trajectories of territorialization in Phase 2.

It is also worth noting that Cluster C, the largest community in Phase 1, decreased in scale in Phase 2, with only three new graves being dug within this cluster. Compared to Cluster B, which saw ten graves added, this expansion in cemetery size was relatively small-scale. At the same time, Cluster C members refrained from using pottery in mortuary contexts. Conversely, Cluster B, which had not included graves that yielded ceramic containers in Phase 1, saw three burials (CM003, CM004, and the double burial of CM010 and CM011) with pottery added in Phase 2.[49] It appears that Cluster B members had adopted a new way of territorialization, becoming more inclined to construct memories through the mediatory and mnemonic capacities of ceramic artifacts. Or, I may assert that Cluster B and C went through distinct deterritorialization processes, during which the adoption of new mortuary practices served to destabilize pre-existing community identities, whether by enhancing or weakening them.

A similar but even more striking pattern is observed in the distribution of glass beads. Given that I have statistically controlled the effects of bead counts, CA does not consider them a decisive factor. However, taking into consideration the mediatory and mnemonic capacities of glass beads discussed above, I still view them as significant paths to investigate the social of Shihsanhang. Therefore, I drew Figure 39 by employing Jenks'

[49] All the pottery containers were placed adjacent to the crania. CM003 is an archaeologically defined female adult, and CM011 is a male adult.

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natural breaks[50] on the glass bead counts, classifying them into three groups, and coloring them in a graduated form.

Glass bead counts in Phase 2 are strikingly larger than those in Phase 1. While the largest count was 93 in Phase 1, HM014 and HM025, a double burial situated in Cluster O, yielded over 4,000 glass beads.[51] CM001,[52] HM004,[53] and HM062,[54] respectively located in Clusters B, P, and M, also contained no fewer than 1,000 glass beads. Meanwhile, the members of Cluster C, once boasting two graves with relatively more beads in Phase 1, had now ceased placing beads in the new graves. I speculate that this was either due to a change in its territorialization activities or the inability of its members to obtain glass beads in Phase 2.

All of the patterns discussed so far support the following interpretations. From Phase 1 to Phase 2, I can recognize an intensive territorialization process among the Shihsanhang communities. This was embodied in the shortened average distance between graves and the influx of glass beads and ceramic containers into the Shihsanhang burials, which reinforced pre-existing mortuary customs from Phase 1. However, this intensive territorialization process may not have been experienced uniformly across all communities. Given that some communities exhibit slightly different patterns of pottery use in mortuary contexts, and that individuals buried with large numbers of beads are affiliated with only certain communities, I suggest that, as in Phase 1, each community

[50] This method identifies the natural breaks in the statistical distribution of a given dataset, and the breaks can further be used as class limits for a choropleth map (Jenks and Caspall 1971).
[51] The bones of HM014 and HM025 were very disintegrated, and they were mingled with the beads. While HM014's age and sex are unknown, HM025 is a two-to-six-year-old young child. The reason for the child's luxurious mortuary treatment is unknown, but I suspect it was related to older community members' wealth.
[52] The glass beads were piled up at the belly of the skeleton. CM001 is an archaeologically defined male adult. Again, the reason underlying his luxurious mortuary treatment is undetermined.
[53] Some of the glass beads were place at the neck with a knife handle and a bronze bell. These beads were strung together, as the fabrics have remained intact. However, the bones were too fragmented to determine if the beads were worn as a necklace. The other beads were scattered among the bone fragments.
[54] Only the fragments of the femurs were discovered in HM062. The beads were scattered in the backfill.

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territorializes on its own terms. By this, I mean that each community may have different levels of access, or no access at all, to glass beads and pottery. Such disparities may have shaped each community's mortuary practices as in when and with whom to place ceramic containers and large quantities of glass beads. However, I cannot rule out an alternative possibility: the differences in mortuary customs involving glass beads and ceramics may have had little to do with each community's access to these artifacts. Instead, they were the results of community members' decision-making to differentiate themselves from one another through the mediating and mnemonic capacities of glass beads and ceramic containers. As yet, I believe this alternative possibility is less persuasive than the former, and I even suspect that the relationships between communities with regard to glass bead importation and pottery procurement were competitive – I will elaborate on this at the end of the section.

What about the distribution of C2 graves, that is, burials containing knife handles? These graves exhibit a distribution pattern very similar to that of glass beads – they are all situated in distinct communities. BM080,[55] HM004, HM019,[56] HM022,[57] and HM083[58] are affiliated with Clusters R, P, M, L, and H, respectively. Tying the shamanic powers of the Aboriginal knife handles discussed above to their Shihsanhang counterparts, the distribution pattern of C2 graves may imply that shamanic figures were also community members in Phase 2. Or can I suspect even further that specific communities were blessed with such shamanic powers and inclined to construct memories related to them, while the others were not?

[55] HM080 was heavily disturbed by an excavator. The knife handle was found 10cm north to the remains of the skeleton.
[56] The bones of HM019 were very fragmented. The knife handle was found within a ceramic jar serving as grave goods on top of the bones.
[57] HM022's knife handle was found within a ceramic jar 5cm to the southeast of the cranium.
[58] HM083 was holding the knife handle in the hands when revealed.

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Interestingly, HM022 was a two- to six-year-old young child, and HM019 was a seven- to twelve-year-old child. Conversely, BM080 was an adult, approximately 25 to 35 years old, and exhibited somewhat male osteological characteristics. HM083 was a 35- to 45-year-old mature male adult. The remaining C2 graves do not contain skeletons that can be anatomically sexed or aged. Given the young age of two of the C2 grave occupants, could it be that the exercise of magic power began at youth? Or was the inclusion of knife handles in HM019 and HM022 related to other reasons? Furthermore, given that Father Esquivel wrote of "sorceresses" (Borao Mateo 2001:180) among the Tamsui Aborigines, the relations between genders at Shihsanhang and the anatomically defined sexes pose another issue. These are the questions I currently cannot affirmatively address.

As in Phase 1, graves that deviated from the mainstream mortuary custom existed in Phase 2, but they may still have been included within communities or accorded grave goods. BM023 and BM028 were buried in an extended position, but they were affiliated with Cluster O (Figure 17). On the contrary, the remaining skeletons in an extended position – BM002, BM011, and BM038 – were located outside of any cluster. The living placed one glass bead within BM002 and two pottery containers in BM038. Notably, BM011 was a headhunt victim, as there were cut marks on the 25- to 35-year-old male's cervical vertebrae. I suggest that because this individual suffered an unfortunate death, he was afforded a mortuary custom different from the mainstream.

As for head orientations, Clusters B, E, I, and J all consist of at least one grave whose head is not oriented southwest (Figure 20). Among the graves with anomalous head orientations but were affiliated with communities, CM004 yielded a ceramic jar, 159 glass

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beads, 65 carnelian beads, and two bronze bells;[59] CM021 was unearthed with three glass beads and seven carnelian beads;[60] CM034 yielded one glass bead; and HM053 was found with 17 glass beads and five carnelian beads. Although the amount of grave goods was not huge compared to the other graves mentioned previously, I retain my interpretation put forth earlier in this section: in Phase 2, deviations from the Shihsanhang mainstream mortuary treatment existed, and some communities incorporated such deviations, as actualized in the spatial proximity of these anomalous graves to the communities and the inclusion of grave goods which released mediating and mnemonic capacities in these graves.

Apart from those previously mentioned, some of the 20% of graves that did not affiliate with any community were also provided with grave goods. Revisiting Figure 34 and Figure 39, I observe that HM059 consists of one knife handle;[61] BM016,[62] BM030,[63] and HM005[64] respectively contain 800, 3,129, and 2,117 intact glass beads; BM003, BM035, BM036, BM043, BM055, BM062, BM078, CM025, CM040, HM012, HM015, HM039, HM091, and HM118[65] are situated outside of all clusters, yet each was buried with one to two ceramic containers.

As in Phase 1, I propose the following speculations regarding these patterns. First, some of these individuals may have held a unique social status during their lifetimes or at the time of their death and were therefore segregated from communal cemeteries. This

[59] The grave goods were discovered within the ceramic jar.
[60] The beads were located directly adjacent to the cranium. They were probably head adornments.
[61] The knife handle of HM059 was found approximately 30cm southwest to the fragments of the cranium.
[62] The skeleton of BM016 is very rotten. Beads were unearthed within the backfill of the grave and a ceramic jar that served as grave goods.
[63] Several teeth are all that remained from BM030's bones. The beads are scattered around the teeth.
[64] The beads were found in a pile directly adjacent to one humerus.
[65] Except for that of HM118, all the ceramic containers were unearthed adjacent to the crania or their fragments. The pottery of HM118 was revealed directly adjacent to the fragments of the femurs.

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may form part of the territorialization processes of the communities, as excluding some individuals from cemeteries may serve as a practice of denying these individuals' membership in the communities, thus enhancing a given community's internal cohesiveness. Interestingly, BM035 was interred with a bronze spoon,[66] and BM062 was buried with a bronze plaque, ten bronze coins, and three bronze bells.[67] Since these artifacts were rare among Shihsanhang burials throughout all three phases, they likely constructed social memories distinct from those of other graves, thereby supporting the first speculation that the individuals probably held a unique social status and were therefore excluded from grave clusters and accorded with distinct memories. Second, communal fission may have occurred, with some individuals departing from the communities to which they had initially belonged. This resulted in some of the mentioned deceased individuals being excluded from grave clusters in Phase 2, but they comprised new clusters with later graves in Phase 3. For instance, BM043 and BM044 formed a new Cluster V in Phase 3 after a later grave had been dug near them; similarly, BM058, which was not given any grave goods, comprised Cluster Z with six new graves in Phase 3. Last but not least, these patterns were likely a mere result of the inaccuracy of cluster drawing, as the ANN-observed mean distances and the delineated clusters based on them are *estimations* of mortuary practices.

10.4.Phase 3

I will now zoom in on Phase 3. Compared to Phase 2, the first striking difference is a sudden decline in the use of beads, pottery, and knife handles as grave goods. The second striking difference lies in a shift in the preferred location of the cemeteries. While

[66] The bronze spoon of BM035 was discovered in a ceramic jar placed adjacent to the cranium. BM035 shows somewhat female osteological characteristics, and was 35 to 45 years old.
[67] BM062 was a 12 to 17 years old adolescent. The bronzes were unearthed with potsherds of a jar, 20cm southwest to some teeth – all that remained from the skeleton.

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the majority of Phase 2 graves had expanded into areas beyond Sector C, the primary cemetery location in Phase 1, Phase 3 graves were dug around clusters identified in the earlier phase. My interpretation is that these two patterns are interrelated: let me articulate further.

According to Figure 36 and Figure 37, generally speaking, the quality and quantity of grave goods in Phase 3 do not exhibit statistically significant differences from grave to grave. The largest intact glass bead count was 192 in HM088,[68] a number significantly smaller than the maximum count in the previous phase. Meanwhile, among the 75 graves from Phase 3, only eight graves contain ceramic artifacts, which is approximately 10%. This contrasts notably with Phase 2, in which 39% of graves were buried with ceramics. Knife handles were excluded from mortuary contexts altogether in Phase 3. These patterns may result from a decline or cessation in bead and knife handle imports, or that the practice of placing foreign goods in graves fell out of trend (i.e., a shift in mortuary customs unrelated to the procurement of foreign goods). I believe the former argument is more convincing, and I will explain this later in this section.

As the artifacts that released mediating and mnemonic capacities had declined or disappeared, the nature of the social memories constructed during funerary rites had certainly changed as well. Now, the communities established since Phase 2 appeared to confront a problem: to maintain territorialization, what was the alternative to brandishing mediating and mnemonic artifacts during funerary rites?

I propose that this alternative involves burying the dead closer to one another and to older graves to emphasize the ties of relatedness between the living and their ancestors.

[68] The beads from BM088 were mingled and unearthed with bone fragments.

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Hence, this resulted in a shorter observed mean distance between graves. As demonstrated in Figure 12, the Shihsanhang dwellers in Phase 3 tended to maintain the existing burial clusters rather than interring the dead elsewhere. This is a striking divergence from Phase 2, during which residents had been inclined to expand into new places for inhumation. Two communities go even further by merging with each other: Cluster L and M, which had been distinct communities in Phase 2, now became one – Cluster LM – in Phase 3. Notably, each of these previously distinct clusters consisted of one grave with a knife handle in Phase 2. Cluster M even contained HM062, a grave built in Phase 2 that included 1,833 intact glass beads. Perhaps the mentioned problem with territorialization was more intensely experienced by the members of Clusters L and M, which appear to construct many distinct social memories through the use of beads and knife handles within mortuary contexts in Phase 2. And perhaps this led to their integration? Indeed, as discussed, my demarcation of grave clusters is a mere *estimation* of past mortuary practices, and it remains difficult to determine if the two communities truly united or not.

Some aspects remained unchanged from Phase 2 to Phase 3, such as the incorporation of non-uniformity in mortuary treatment within communities. This was embodied in some community members' anomalous postures or head orientations (Figure 18 and Figure 21). For example, HM052 and HM055 were buried in an extended position with their heads oriented northeast, and both were affiliated with Cluster I. Another burial, HM105, had its head oriented northwest, but it was affiliated with Cluster J. BM063's head was oriented northeast, but forms part of Cluster R. These patterns indicate that while some mortuary practices, such as the inclusion of beads and pottery in graves, declined, others persisted.

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All of these patterns in Phase 3 highlight the uniqueness of BM001. It is the only grave classified as C1 in this phase, and its grave goods were truly extraordinary: 58 limestone beads and one silver foil item, both of which had never been discovered at Shihsanhang.[69] BM001 also contains 273 carnelian beads,[70] an artifact that has become quite scarce in mortuary contexts in Phase 3. This 12- to 17-year-old adolescent was buried to the east of BM011, the headhunting victim with the head oriented northeast. These phenomena appear to suggest that BM011 was excluded from other communities: if so, why was this the case? Although I cannot answer this question at present, I can at least assert with certainty that new artifacts – limestone beads and silver foil items – were incorporated into territorialization processes inherited from the past.

10.5.What Triggered the Changes?

At the end of this section, I would like to address one final, yet critical, issue: What caused the changes in the mortuary practices of some communities from Phase 1 to Phase 2 and from Phase 2 to Phase 3, as primarily embodied in the abrupt increase and decline in the use of glass beads and ceramic artifacts in mortuary contexts, and the shifts in the preferred cemetery location? I propose that the introduction of iron production may have influenced the changes from Phase 1 to Phase 2. In contrast, the changes from Phase 2 to Phase 3 may be attributed to a shift in the exchange networks of the Shihsanhang residents, from those linked to Southeast Asia to those associated with the Han Chinese.

As argued by Chen Kwang-tzu (陳光祖, et al. 2019) and introduced in “Past Research on Shihsanhang” section, iron production at Shihsanhang commenced no earlier

[69] The limestone beads were revealed 20cm north to the cranium. The exact location of the silver foil item was not recorded.
[70] The carnelian beads were found to the southeast within 10cm to the cranium, scattered among the fragments of a ceramic jar and a glass bracelet.

doi:10.6342/NTU202502709

than ca. 1400 cal. B.P. This date, interestingly, coincides with the start of Phase 2. Furthermore, following Chen's (2000) earlier argument, as iron ore could not be monopolized, any household, or, in resonance with this study, community that possessed the knowledge for ferrous metallurgical activities could engage in iron production, due to the ready presence of iron raw material. Therefore, following Wang (王冠文 2025), I also suggest that ferrous metallurgical activities were the impetus for an increase in the Shihsanhang population – whether by natural growth or immigration – and for some communities' new mortuary practices.

Though the exact process of this change requires further investigation, my research provides an intra-site perspective to Wang's proposition of treating Shihsanhang as a "node of technical advantage" across Taiwan during the 1st millennium A.D. I suspect that within Shihsanhang, only specific communities, which were capable of, or by whatever means were involved in, iron production, enjoyed a higher level of access to (foreign) goods such as pottery, glass and carnelian beads, and knife handles. This encouraged the pre-existing tendency to brandish these artifacts, which embodied mediating, mnemonic, or shamanic capacities, during funerary rites. I also infer that cross-community competition in wealth and related memory-construction activities was thus engendered. All of these speculations await further exploration and confirmation.

The commencement of Phase 3, ca. 1050-900 cal. B.P., coincides approximately with the timing when glass and other artifacts of Chinese origin gradually increased in number relative to those from Southeast Asian sources among the residents of the island of Formosa (Wang 2016, 2018; 劉益昌 2019; 王冠文 2025). As observed by Wang (王冠文 2025), the number of Chinese high-lead beads gradually rose within the North-Northeastern Region in Taiwan after ca. 1000-800 B.P., while Liu (劉益昌 2019) noticed

doi:10.6342/NTU202502709

that Chinese porcelains are unearthed in larger quantity and higher frequency across the Formosan Island compared to before ca. 1000 B.P. Perhaps, citing Liu (劉益昌 2019), the Southeast Asian exchange network Shihsanhang initially participated in was cut off by the Chinese, and the Shihsanhang residents had to deal with different exchange customs, thus getting fewer beads and no knife handles? If this was the case, what exactly was the change process like? Again, my inference awaits further research and verification.

10.6.Section Summary

Returning to the research questions and the title of my thesis, I suggest that the assembling of Shihsanhang, i.e., putting together human and non-human components that possess distinct properties into a working compound involving an identity and internal cohesiveness, was brought about through a variety of capacity release involving people and things that forms a landscape of relatedness. Through the articulation presented in this section, I observe variabilities in mortuary practices throughout the three phases, which consolidated in the site's landscape in response to the broader temporal-spatial flow of artifacts and techniques into the site – burying the dead closer and closer to each other; fluctuations in bead, ceramics, and knife handle use; the exiting of knife handles and entering of limestone beads into the social world of Shihsanhang, and so forth. Within this interactive scenario, living people were taking advantage of the varying natures of the mediatory and mnemonic capacities of artifacts; Artifacts were "making differences" (Latour 1992, 2005) among the encounters between the living and the dead, meaning that specific memories reserved to some people were constituting the territorialization of communities; Following Sahlins (2022), Carsten (1995), and McAnany (2010), I also argue that the dead were "being here" in the residential areas to maintain the ties of

doi:10.6342/NTU202502709

relatedness sought by both the deceased and the living. These practices constituted a mortuary landscape that embodied the territorialization of communities at Shihsanhang.

Each community, a working compound *sui generis*, was not identical in territorialization processes with one another. Each community constructed distinctive memories, varied in size, probably had different levels of access to specific artifacts, and accommodated non-uniformity to varying extents, as we can see actualized in anomalous postures and head orientations of skeletons. A few graves, probably due to reasons of social status or conditions of death, were excluded from communities, which, in turn, enhanced the internal cohesiveness of communities. All of these practices contributed to each community's territorialization on its own terms, and henceforth, to analogize Shihsanhang as a cybernetic system, with inputs and outputs and internal mechanisms and processes, does not capture such dynamics and heterogeneity. Rather than a mechanical flow diagram, Shihsanhang is assembled from multiple heterogeneous communities into one entity greater than the sum of these communities.

To say that Shihsanhang is an assemblage, or an assemblage of assemblage-cum-communities, indicates that it engages in territorialization to maintain internal cohesiveness as a whole. This brings the persisting, mainstream mortuary customs across spatial and temporal scales into focus. Although communities may vary somewhat in mortuary practices, the graves statistically lean toward a similar posture – a flexed position with the head oriented southwest. Throughout the three phases, only two communities spatially united, indicating an inter-communal maintenance of community demarcation. This could result from an inaccuracy in the GIS estimations of mortuary practices. Yet, suppose the estimations truly align with past mortuary practices. In that case, it seems fair to say that each community, whether old or new, still adhered to a set

doi:10.6342/NTU202502709

of persistent, mainstream mortuary customs that embodied the territorialization of Shihsanhang as one cohesive assemblage.

doi:10.6342/NTU202502709

CHAPTER 11: CONCLUSION

Located in the northwest opening of the Taipei Basin, northern Taiwan, the Shihsanhang site (ca. 1800-550 cal. B.P.) is one of the most significant Metal Age (ca. 2400-450 B.P.) settlement sites in Taiwanese archaeology. As the oldest site known to yield remains of *in situ* iron production in Taiwan, past research on Shihsanhang has focused on how the settlement functioned as a social system, the social units that carried out ferrous metallurgical techniques, and the maritime exchange networks that the abundance of glass beads unearthed at the site pointed to. However, inquiries about the social, as seen in mortuary data, are currently lacking. Therefore, my study aims to explore the types of intimate relations between the living, the dead, and grave goods that were practiced, and how these relations serve to construct and embody the social at Shihsanhang, with an eye to anthropological discussions about human-non-human relations.

I began this study by critically reviewing past research on the Shihsanhang site, which primarily includes the works of Chen (2000; 陳光祖, et al. 2019), Tsang (2010 [2002]), Liu (劉益昌, 2002, 2019), and Wang (2016, 2018). While past studies provide invaluable insights that my study builds upon, especially the depiction of the broader spatio-temporal flow of artifacts and metallurgical techniques into the site (Wang 2016, 2018; 劉益昌 2019; 陳光祖, et al. 2019), the portrayal of the probable stages within a funerary rite at Shihsanhang (Tsang 2010[2002]), and the articulation of the social units that were involved in iron production (Chen 2000), I identify four issues in them that are worth rethinking and further exploration.

doi:10.6342/NTU202502709

First, intra-site chronological control, i.e, tracing the formation sequences of features and the vertical and horizontal stratigraphy of the remains across the site, is largely lacking. Without chronological sequencing of the remains, which embodied the practices of the Shihsanhang residents, past scholars risked treating the Shihsanhang residents as socially static and uniform. Second, by reifying Shihsanhang into a systematic flow chart called a "social system," which operated according to functional mechanisms, archaeologists were treating the social as fulfilling adaptive goals. At the same time, people were conceived of as distant from the social, which was programmed according to some input/output feedback. Here, the social was considered cybernetic instead of humanistic (Shanks and Tilley 1987). Third, by taking the settlement and ethnic groups uncritically as self-evident analytical units, researchers were shoehorning the past into predefined categories of social entities. The concepts of settlement and ethnicity, as applied in the investigation of the social of Taiwanese Austronesian-speaking groups, both past and present, are derived from the Japanese colonial authority's strategic ethnological classification (林開世 2014; 黃應貴 2012, 2020). Thus, rather than uncritically assuming that the settlement and ethnic group are self-evident, archaeologists should explore what other social entities were salient in the past and could be appreciated through the remains. Finally, when archaeologists perceive humans as the sole agents behind the meaningful worlds that humans themselves also constructed, they overlook objects' active roles in the construction of the social (Latour 1992, 2005), or the viewpoints and capabilities of other non-humans in worlds distinct from archaeologists' (Sahlins 2022; Viveiros de Castro 1998).

In response to these issues, I was prompted to wonder what kind of archaeological study can I do for the Shihsanhang mortuary to explore how (living and deceased) people and things encountered each other; how people and things somehow exerted a variety of

doi:10.6342/NTU202502709

capacities during practices and, hand in hand, produced a working cohort with an identity; and how such cohorts formed larger cohorts (Bennett 2010; DeLanda 2006). All in all, I was intrigued to explore: how did the Shihsanhang residents, both human and non-human, interrelate with each other? If a settlement site such as Shihsanhang should not be taken as a self-evident social unit, what kind of social entities larger than each individual member should we reconstruct Shihsanhang as accommodating? What was put into practice to "assemble" these social entities, i.e., how were human and non-human components that possess distinct properties put together into a working compound involving an identity and internal cohesiveness? What were these social entities' relations? Last but not least, how can I address these questions by investigating the people and things related to death – graves, burial goods, the deceased, and the living (mourners), etc., at Shihsanhang?

Grounding these questions in assemblage theory, as discussed by several scholars from multi-disciplinary backgrounds (Bennett 2010; DeLanda 2006, 2016; Hamilakis 2017; Hamilakis and Jones 2017; Harris 2014b; Robinson 2017; Tsing 2015), I set my approach against the cybernetic and utilitarian notions underlying the concept of the system. In addition to employing chronological control based on relative dating verified by C14 determinations, the methods I adopted to address the proposed problems include spatial and statistical analysis, assisted by GIS software and the R programming language. More precisely, the analytical tools include Global Moran's I (GMI), Average Nearest Neighbor (ANN), Buffering, Spearman's correlation (SC) coefficient, and cluster analysis (CA).

As stated, I uphold assemblage theory as the ontological stance during this investigation of the social of Shihsanhang. Rather than the causal linear relations between

doi:10.6342/NTU202502709

parts postulated in the concept of a cybernetic system, which was employed during the interpretation of the social of Shihsanhang by Tsang (2010[2002]), the idea of assemblage emphasizes encounters between human and non-human components that are contingently obligatory (DeLanda 2006). In an assemblage, the properties of a given component are contained in the component itself instead of deriving from its relations with other components. Thus, a component can be detached from one assemblage and plugged into another contingently through the course of history, without altering the component's property (DeLanda 2006, 2016). During contingently obligatory encounters between components, each component releases capacities that stem from its properties (DeLanda 2006; Robinson 2017). Via a variety of capacity release that involves recurrent practices within landscapes (Ingold 1993), the identity and the internal cohesiveness of the assemblage are produced, which is a process termed "territorialization" (DeLanda 2006, 2016). Thus, to restate, to "assemble" means to put together different-natured components into a working compound that produces something more than the sum of the components, namely, the mentioned identity and internal cohesiveness. In contrast with the cybernetic system, assemblage underscores openness, precarity, and heterogeneity (DeLanda 2006, 2016; Tsing 2015). A community – the social entity I look for in this research – can thus be understood with the concept of assemblage as a working cohort of humans and non-humans with an identity (Harris 2013, 2014b).

Since we can trace contingently obligatory encounters endlessly, without specifying the scale of investigation, assemblages can expand infinitely. Thus, in my study, the scale of inquiry is that of a "community." Rather than another pre-classified social category that reifies past lives, the community is a loosely defined, in-the-making unit of social affiliation, a concept that encourages archaeologists to look for constructive practices of identities in landscapes (Birch 2014a; Canuto and Yaeger 2000b). Such landscapes are

doi:10.6342/NTU202502709

the vital dimension of territorialization, which, I argue, following Ingold (1993), embody pasts interactions between components in the present and project them toward the future. Following Harris (2013, 2014b), in my analysis of social entities, I define a community at Shihsanhang as an assemblage that involves multiple humans and non-humans, at a scale larger than an individual grave and smaller than the whole site. My definition is also supported by generalizations about how mortuary data represents the living's social unit (Goldstein 1981; Saxe 1970), by drawing analogies to ethnohistorical texts (黃叔璥, et al. 2021[1722]), and by the archaeological evidence from Shihsanhang (Zhang 2023).

Drawing a correspondence between the concepts of assemblage and community also encourages me to explore the capacities released between living people, burials, and grave goods. I suggest that the capacity of grave goods during their confrontation with the living and the dead was mediatory and mnemonic (Latour 2005; Rowlands 1993). Mediatory means being able to transport, modify, or distort social signals (Latour 2005), and in Shihsanhang's case, this capacity would have been released by beads, pottery, and potentially other artifacts, which, according to ethnohistorical texts, were mediators of prestige or other social relations. The beads and pottery also release a mnemonic capacity in that they embodied memories of the mediatory capacity exerted by the deceased or the community that prepared the funeral (Rowlands 1993). The memories thusly engendered were reserved for the witnesses of the funeral (Joyce 2003). The capacity of the dead lies in their "being here" (Sahlins 2022) in the residential areas, meaning that the dead members of a given community were ancestralized, continued to live with the living, and served as the living's source of life and welfare through residential burial. As a result, the dead's "being there" allows them to maintain a tie of relatedness (Carsten 1995) with the communities they belonged to, as supported by generalizations about residential burials (Adams and King 2010; McAnany 2010) and ethnohistorical and ethnographic analogies

doi:10.6342/NTU202502709

(楊淑媛 2007; 達少 and 歐嗨 2021; 黃應貴 2012). The encounters and capacity release among the living, the deceased, and the artifacts comprising the burial goods sustained the identities and internal cohesion of different assemblage-cum-community.

At Shihsanhang, individuals were normally interred in a flexed position with heads oriented southwest. Graves were in close spatial proximity with other features such as postholes, pits, shell middens, and hearths, and there is clear evidence of these features, including graves, cutting through each other. Thus, I consider the Shihsanhang graves residential. I selected the graves from three excavation sectors (Sectors B, C, and H) arbitrarily demarcated during the 1990-1992 field seasons for this study (Figure 3), due to the fact that 11 burials from these three sectors underwent radiocarbon dating (Table 1), while none of those from other sectors were dated. The first stage of the research is to gain chronological control over the burial data. Following Harris's (2014a) stratigraphic observations, I do this by differentiating whether the openings of the graves were located at the base of or within the Shihsanhang Culture Layer, and dividing the burials scattered across the three sectors into six initial groups. Subsequently, I regrouped these six initial clusters by verifying their contemporaneity with the 11 available C14 determinations (Table 1). Then, I could divide the 256 graves analyzed in this study into three chronological phases, namely, Phase 1 (ca. 1800-1400 cal. B.P.), Phase 2 (ca. 1400-1050 cal. B.P.), and Phase 3 (ca. 1050-550 cal. B.P.).

Subsequently, I conducted the Average Nearest Neighbor (ANN), Global Moran's I (GMI), Buffering, Spearman's correlation (SC) coefficient, and cluster analysis (CA). The analytical results demonstrate that the Shihsanhang graves are overtly clustered, and I can visualize the grave clusters with buffers based on the ANN-observed mean distances of the grave intervals in the three different chronological phases. As detected by GMI,

doi:10.6342/NTU202502709

throughout the three phases, the graves are not spatially organized around sex or age, nor do numerous grave goods exhibit correlations with each other, or with sex and age. CA divides the graves from Phase 1, containing varying quantities and qualities of burial goods, into three statistical clusters according to the amount of glass beads and the presence or absence of pottery (Table 7). Graves from Phase 2 were classified into three statistical clusters according to the presence or absence of pottery and bronze knife handles (Table 8). Graves from Phase 2 were segregated into two statistical clusters according to the presence or absence of limestone beads (Table 9).

Based on these analytical results, I attempt to develop a dynamic picture of the social world of Shihsanhang. While Tsang (2010[2002]) and Liu (劉益昌 2002, 2019) have proposed that the social system of Shihsanhang should be conceived as a settlement that operates as a cybernetic system, the approach I follow here can offer a strikingly different view.

From a theoretical perspective on the assemblage, I emphasize the constructive nature of practice, which involves both humans and non-humans in the social. Based on this perspective, my chronological control and analytical tools enable me to identify social changes that embody practices across the three phases. I conclude that "assemblage" more accurately captures the heterogeneity and precarity among the Shihsanhang graves throughout the three phases. Living and deceased people, as well as artifacts, were assembled into communities through the mortuary landscape. Each community's mortuary custom in terms of grave goods quantity and quality varies somewhat, and some of the communities' mortuary customs fluctuated with the inflow and outflow of artifacts and metallurgical techniques of the site. Some communities even incorporated anomalous graves, as represented by head orientations other than southwest, and positions other than

doi:10.6342/NTU202502709

flexed. What emerges is a picture of precarity and heterogeneity, rather than some overt, systematic uniformity across time and space.

Still, these communities were further assembled into a single assemblage, that is, Shihsanhang as a whole. Although there was variation among mortuary practices, the practices varied within a given range, which means that the Shihsanhang residents still based their varying mortuary practices on a persistent, broadly similar mortuary custom that involved maintaining the demarcation of communities cross-communally, and burying the dead in a flexed position with the head oriented southwest over hundreds of years. Shihsanhang as a whole was thus territorialized.

During Phase 1 (ca. 1800-1400 cal. B.P.), the mortuary customs that amounted to the territorialization of each assemblage-cum-community within Shihsanhang, and the Shihsanhang assemblage as a whole, were established. These customs primarily include: the sporadic use of beads and ceramic containers among some grave clusters, and numerous individuals were buried in a flexed position with their heads oriented southwest. The inclusion of anomalous graves with varying postures and head orientations within communities also suggest that a certain extent of non-uniformity probably existed in some communities. However, communities were held together less closely compared to the subsequent phases, as evidenced by the Shihsanhang residents' practice of maintaining larger grave intervals. Neither the distinction between the quantity nor the quality of grave goods among the burials were significant.

During Phase 2 (ca. 1400-1050 cal. B.P.), I observe a striking increase in the number of graves, a rise in community number, a shift in the preferred location for inhumation, an influx of glass beads, and an increased use of pottery in mortuary contexts. However, such changes were not uniformly experienced by all communities. Some communities

doi:10.6342/NTU202502709

included a few graves that boasted thousands of glass beads, but others did not. Some communities were more inclined to include pottery in graves, but others were not. I thus conclude that Phase 2 was an age of intense territorialization of communities. The mortuary practices of some communities, rooted in past counterparts, either intensified or declined, likely due to each community's distinct level of access to glass beads and ceramic artifacts. I suspect that the changes in some communities' territorialization patterns were brought about by the introduction of ferrous metallurgical techniques to Shihsanhang in ca. 1400 cal. B.P. As Chen (2000) states, different social units may have been involved to varying extents in iron production and subsequent exports of iron products. I suspect that this was the reason why some communities had more access to imported goods such as glass beads, while others did not.

Additionally, the distribution of knife handles among the grave clusters is uneven. Some grave clusters contain a burial with a knife handle, while others do not. As informed by ethnographic analogies (國分直一 1949; 宮本延人 1949, as cited in 陳光祖 2011), these knife handles were closely associated with shamanic powers. Furthermore, according to ethnohistorical texts (Borao Mateo 2001:180), shamanic figures who had access to shamanic powers were very influential in the social world of the Tamsui Aborigines, as they held spirit-fending rites and monitored alcoholic feasts. Thus, the distribution pattern possibly suggests that some communities were blessed with special access to shamanic power, while others were not. Meanwhile, the non-uniformity within communities observed in Phase 1, as indicated by the inclusion of anomalous graves with varying postures and head orientations, persisted in Phase 2, as well.

Phase 3 (ca. 1050-550 cal. B.P.) sees a decline in the use of grave goods, and I also observe yet another change in the preferred location for inhumation, and I speculate that

doi:10.6342/NTU202502709

these patterns were interrelated. More specifically, there are no longer any graves containing thousands of beads, such as found in Phase 2, and the use of pottery dropped significantly compared to the preceding phase, as well. Having less access to such artifacts, which I argue could release mediatory and mnemonic capacities in Phase 1 and Phase 2 – and were thus factors in the territorialization of communities – meant that the communities at Shihsanhang had to territorialize by other means. During Phase 3, using ANN, I observe that the dead are buried closer to each other. I then interpret this as a reaction to the restriction of access to these burial goods. Thus, the Shihsanhang residents responded by modifying the landscape, meaning that they constructed a more intimate tie of relatedness by burying the dead closer to one another. Two communities, which had each contained a grave with a knife handle, and one of which contained another grave having thousands of beads, probably went as far as to unite with each other. My interpretation is that in Phase 2, the two communities had constructed many distinct social memories through the use of beads and knife handles within mortuary contexts. Thus, the mentioned problem with territorialization was more intensely experienced by the members of the two communities, which constituted their merging to emphasize a shared tie of relatedness. I suspect that the cause of such changes is related to the overall shift in the Shihsanhang residents' exchange networks, from those linked to Southeast Asia to those associated with the Han Chinese. Could this shift possibly lead to a decline in bead and knife handle imports to Shihsanhang and the introduction of new artifacts, thereby triggering changes in the mortuary practices of some communities?

In response to the reviewed past research, the significance of my study lies, first and foremost, in the application of a three-phase chronology for burials based on relative dating through scrutiny of grave openings and verification with C14 determinations of burial contexts. This allows me to observe social differences temporally and avoid

doi:10.6342/NTU202502709

treating Shihsanhang as a static whole. Second, the employment of spatial and statistical analytical tools on the graves within each phase reveals new synchronic dissimilarities in mortuary practices across the site within a given phase (as well as changes through time). Spatial and statistical analyses, coupled with chronological control, help me avoid treating the Shihsanhang residents as uniform, who simply follow some consistent, cybernetic, systematic laws that constitute a "Shihsanhang society" blindly. Thus, through this chronological, spatial approach, I challenge the functional and cybernetic descriptions of Shihsanhang by introducing the concept of assemblage, which highlights the openness, precarity, and heterogeneity of the social. I also emphasize the roles of non-humans in the assembling processes of communities and of a cross-community assemblage within the site's landscape.

However, I acknowledge that my study is not without its problems. The spatial and statistical analyses, on which this research is based, are estimations of practices instead of the practices themselves. Thus, how I delineate a grave cluster and define a community may deviate from how a Shihsanhang resident would have perceived their social world. I also look forward to more fine-grained chronological control, which I am afraid is only possible with more C14 determinations strategically made.

Thus, I expect future research to explore remains beyond mortuary contexts to refine some of the arguments established in this study. Since this study leans heavily on the spatial correlation between postholes and burials that I identified (Zhang 2023), I suggest that future study can reconfirm the contemporaneity and spatial co-presence of mortuary and structural remains. I believe that a more thorough investigation of ceramics, particularly the involved technical systems, and how morphologically distinct wares were distributed across time and space, would reveal the assembling processes of multiple

doi:10.6342/NTU202502709

materials and persons. Delving further into the food patterns of the Shihsanhang residents could not only open a window into how eating and drinking brought people together, but also draw other species into archaeologists' depiction of the social world of Shihsanhang, which not only humans, but different organisms, as well, have collaboratively built up along with artifacts and other things. Then, one could cross-reference these explorations, including mine on mortuary changes, to paint a picture of how people, different species, objects, and artifacts were assembled through a variety of contingently obligatory encounters with one another.

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FIGURE CAPTIONS

Figure 1. Shihsanhang grave goods. a) Pottery vase from grave HM001 (Cataloguing Number: T0030043) (臧振華 and 劉益昌 n.d.-a); b) Carnelian beads from grave BM062 (Cataloguing Number: T0030945) (臧振華 and 劉益昌 n.d.-b); c) Glass beads from grave HM004 (Cataloguing Number: T0030969) (臧振華 and 劉益昌 n.d.-c); d) Bronze knife handle from grave HM019 (Cataloguing Number: T0030259) (臧振華 and 劉益昌 n.d.-d). Image cited from the Open Museum (https://openmuseum.tw/)

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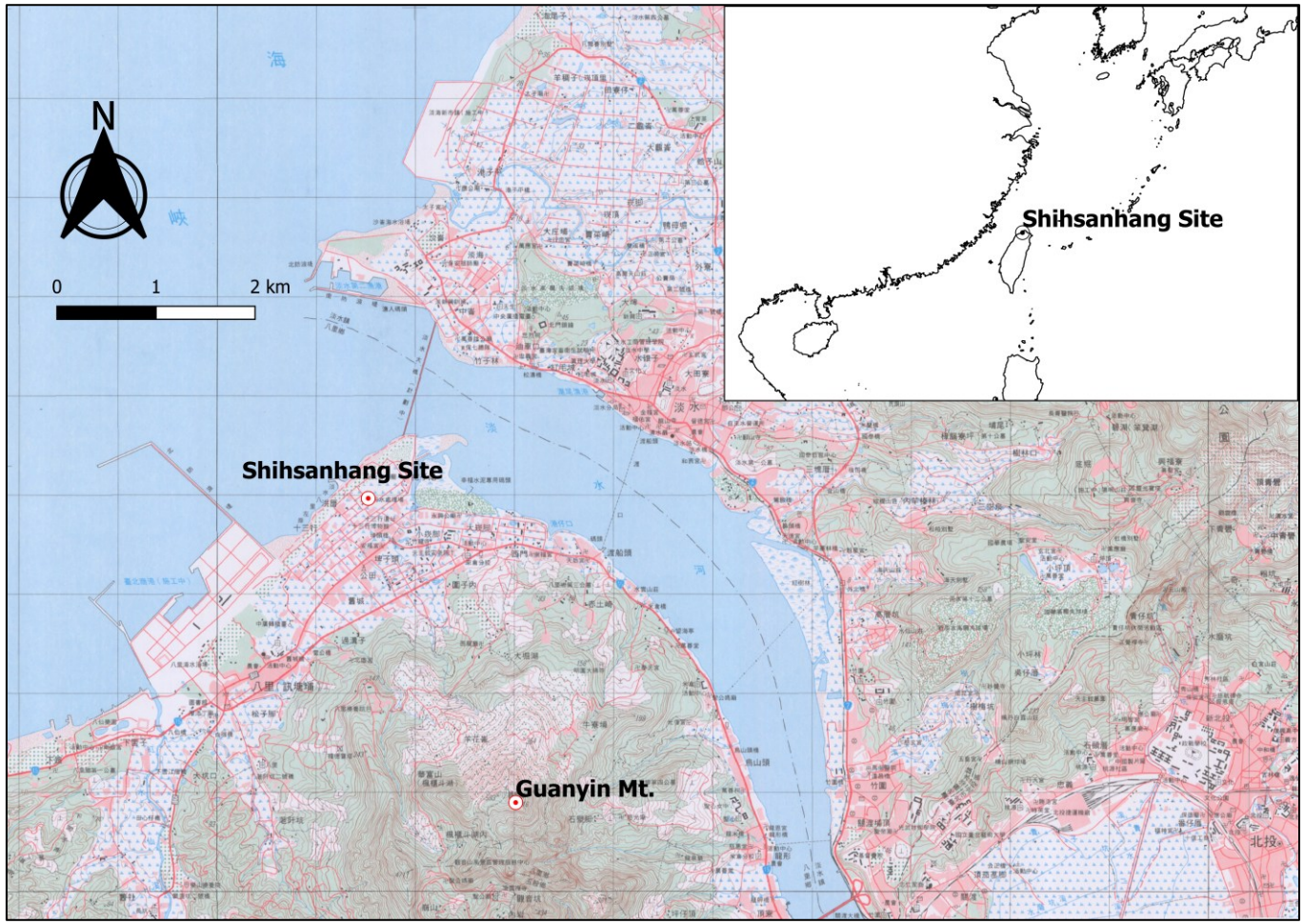

Figure 2. Map of the Shihsanhang site created by the author. Color base map retrieved from Center for GIS, RCHSS, Academia Sinica(中央研究院人社中心地理資訊科學研究專題中心 n.d.). Outline inset provided by Professor Wu Mu-Chun, Department of Anthropology, National Taiwan University.

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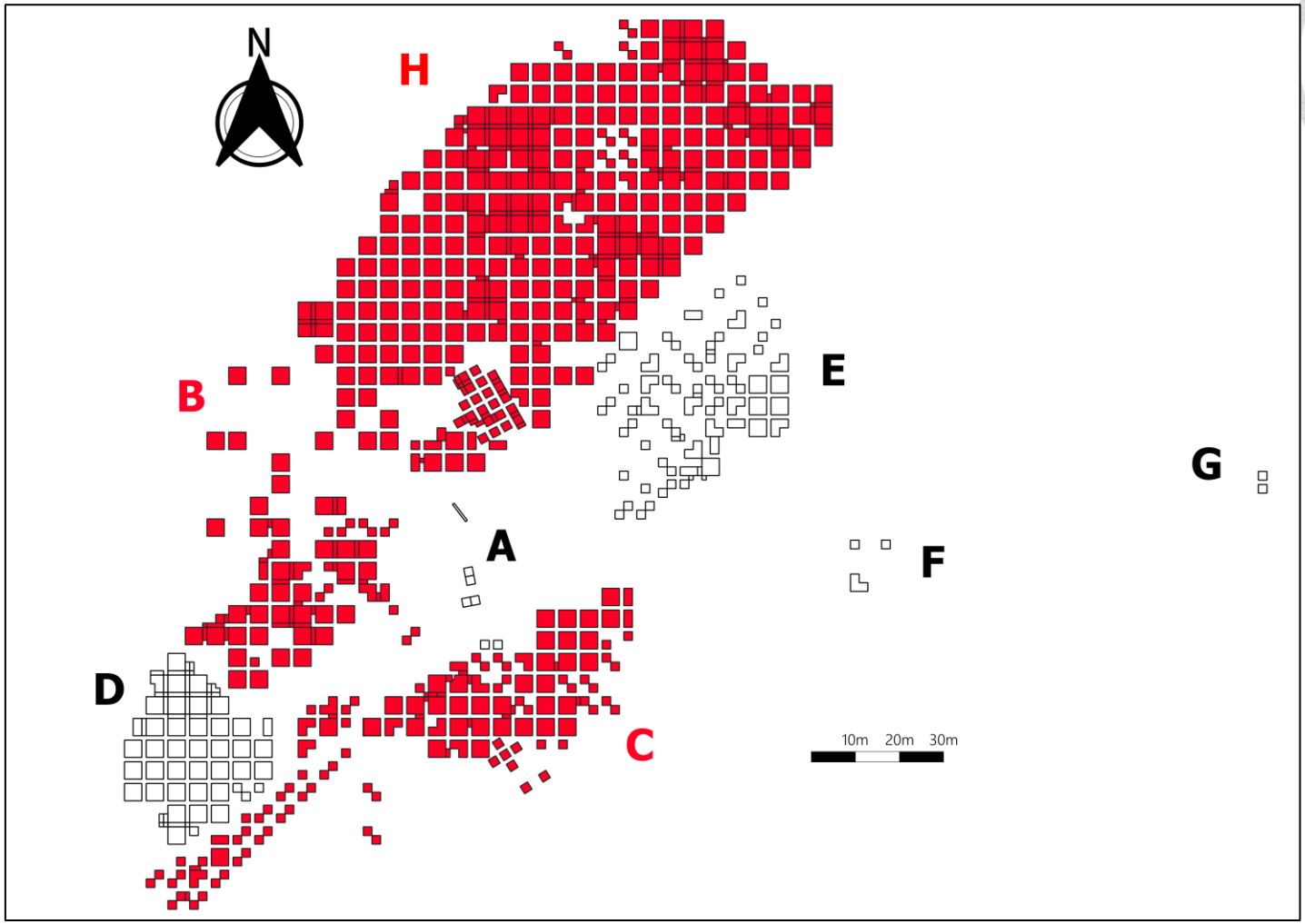

Figure 3. Map of all the excavation sectors of the Shihsanhang site, with Sector B, C, and H marked red. Image created by the author using QGIS with data from the Institute of History and Philology, Academia Sinica, Taiwan.

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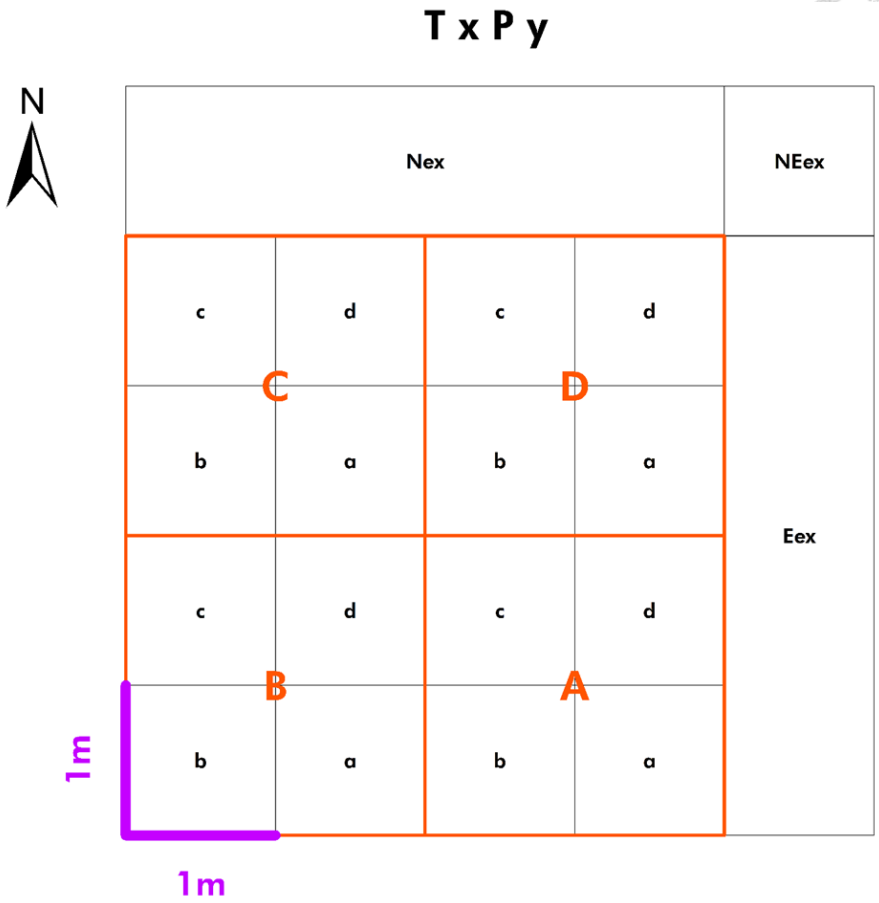

Figure 4. Plan showing the division and labeling of a typical excavation unit of the 1990-1992 salvage excavations of Shihsanhang. Image created by the author.

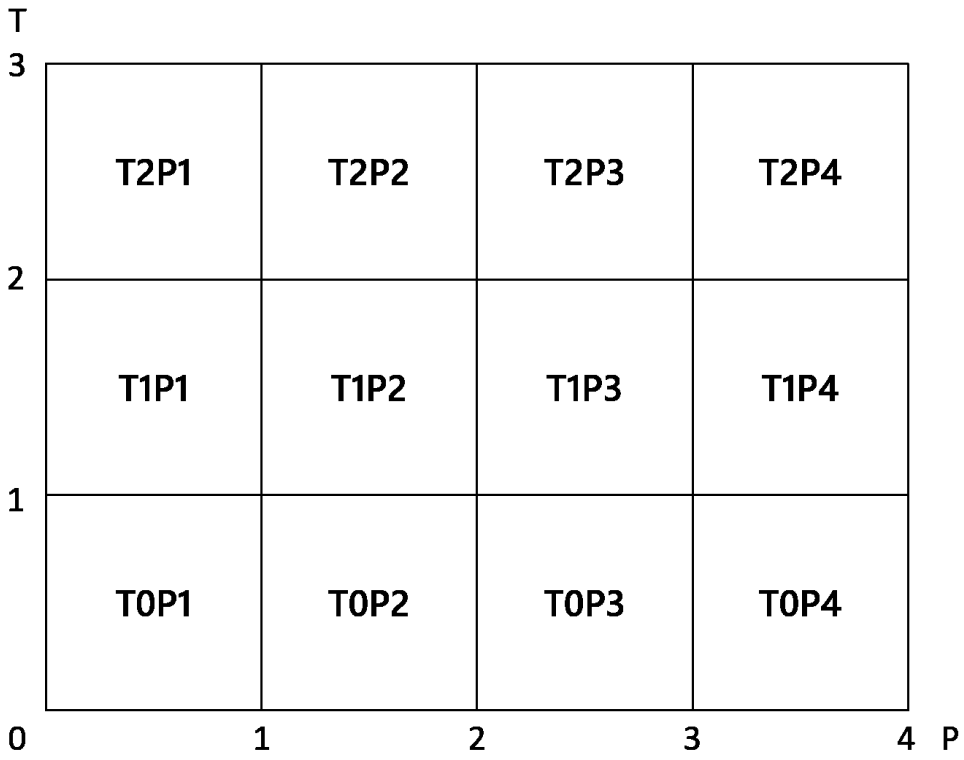

Figure 5. The TP employed system at Shihsanhang. Image created by the author.

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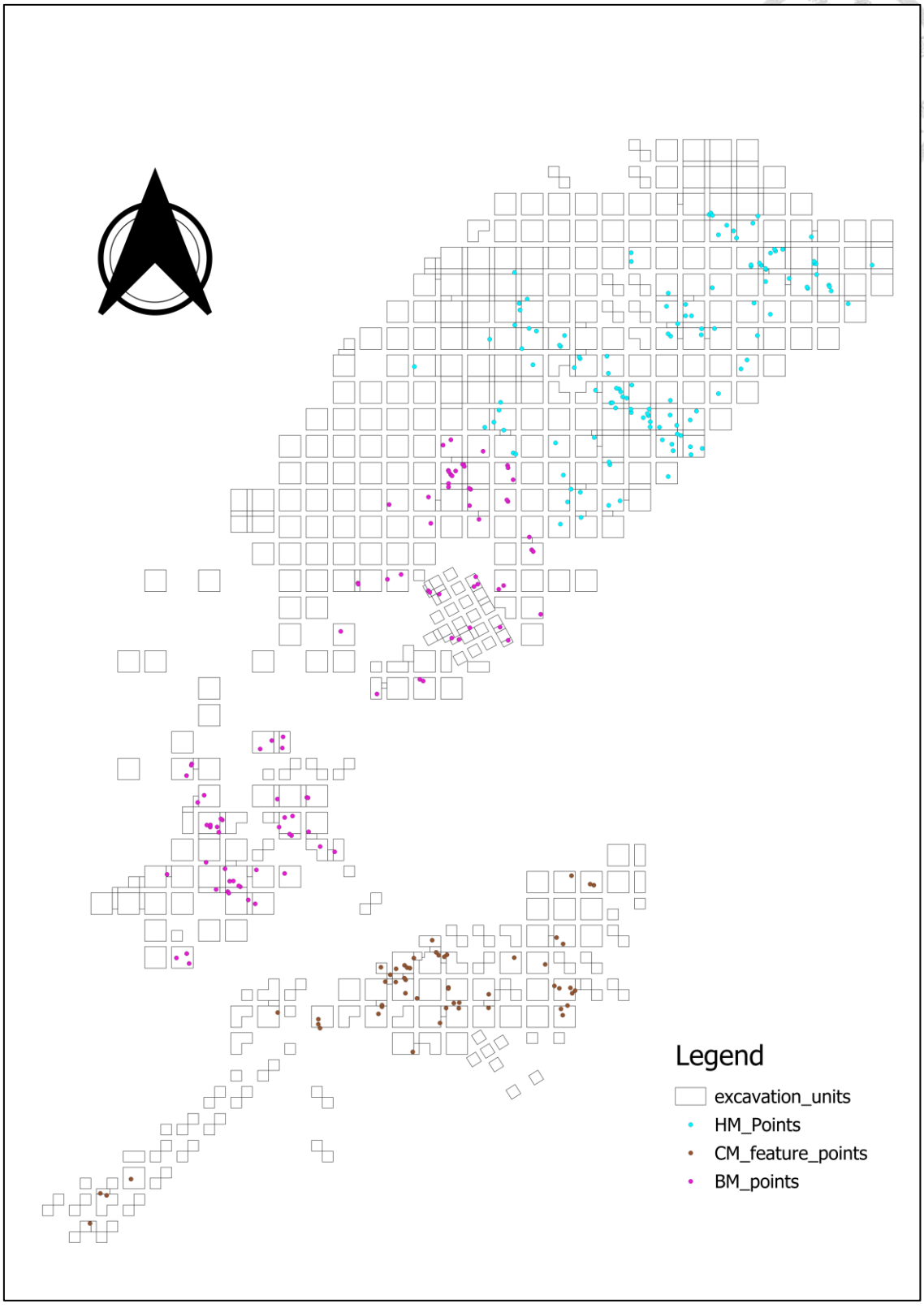

Figure 6. Distribution map of the graves analyzed in this study. Image created by the author.

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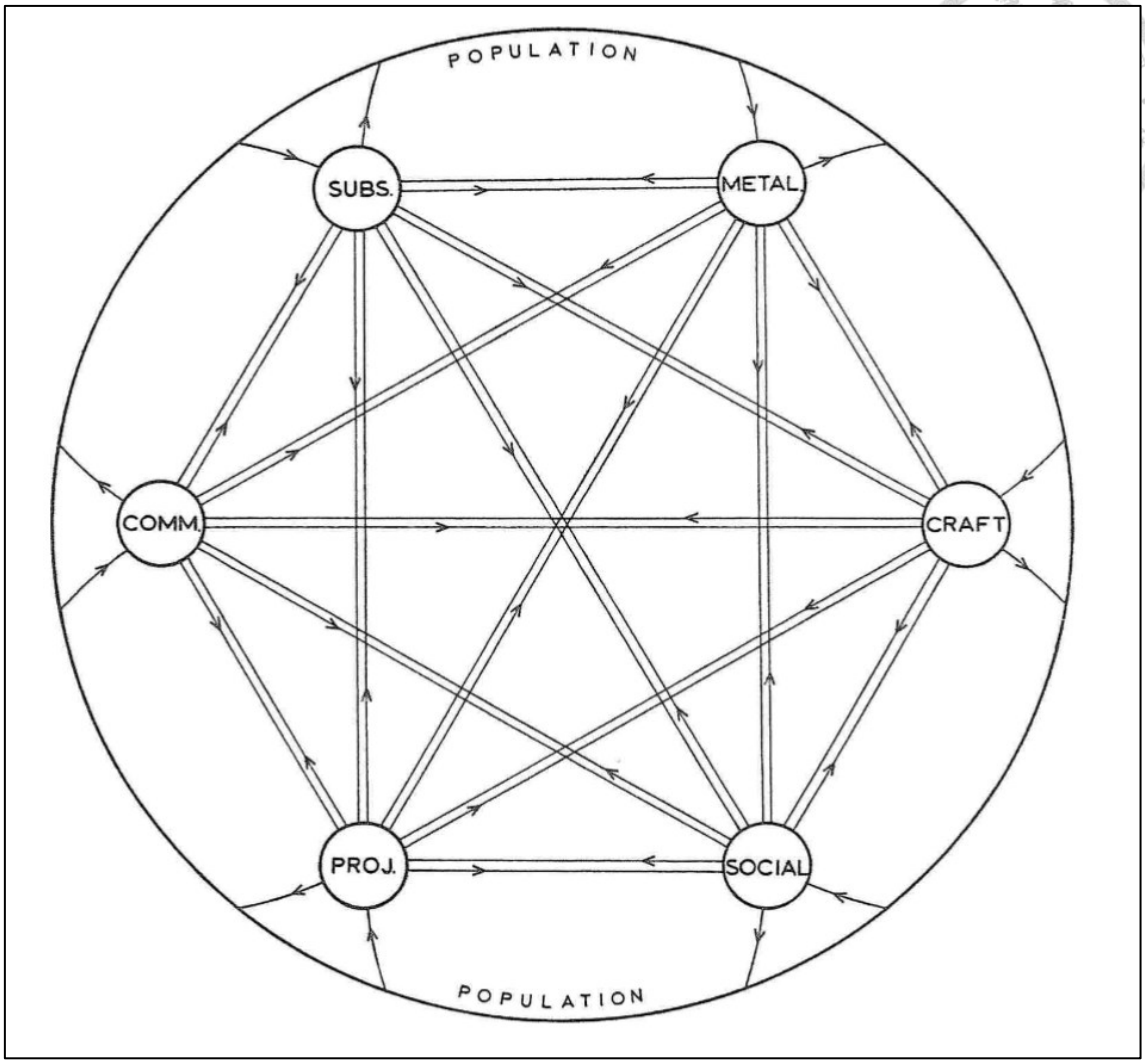

Figure 7. A flow diagram illustrating Colin Renfrew's (2011[1972]) six social subsystems – the craft (technological), social, projective (symbolic), communicative (trade), subsistence, and metallurgical subsystems. Image from the same book.

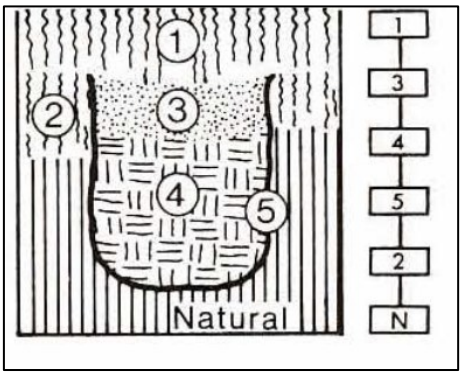

Figure 8. A Harris Matrix showing the formation process of a burial. Image cited from Harris (2014a:140, Figure 58) .

doi:10.6342/NTU202502709

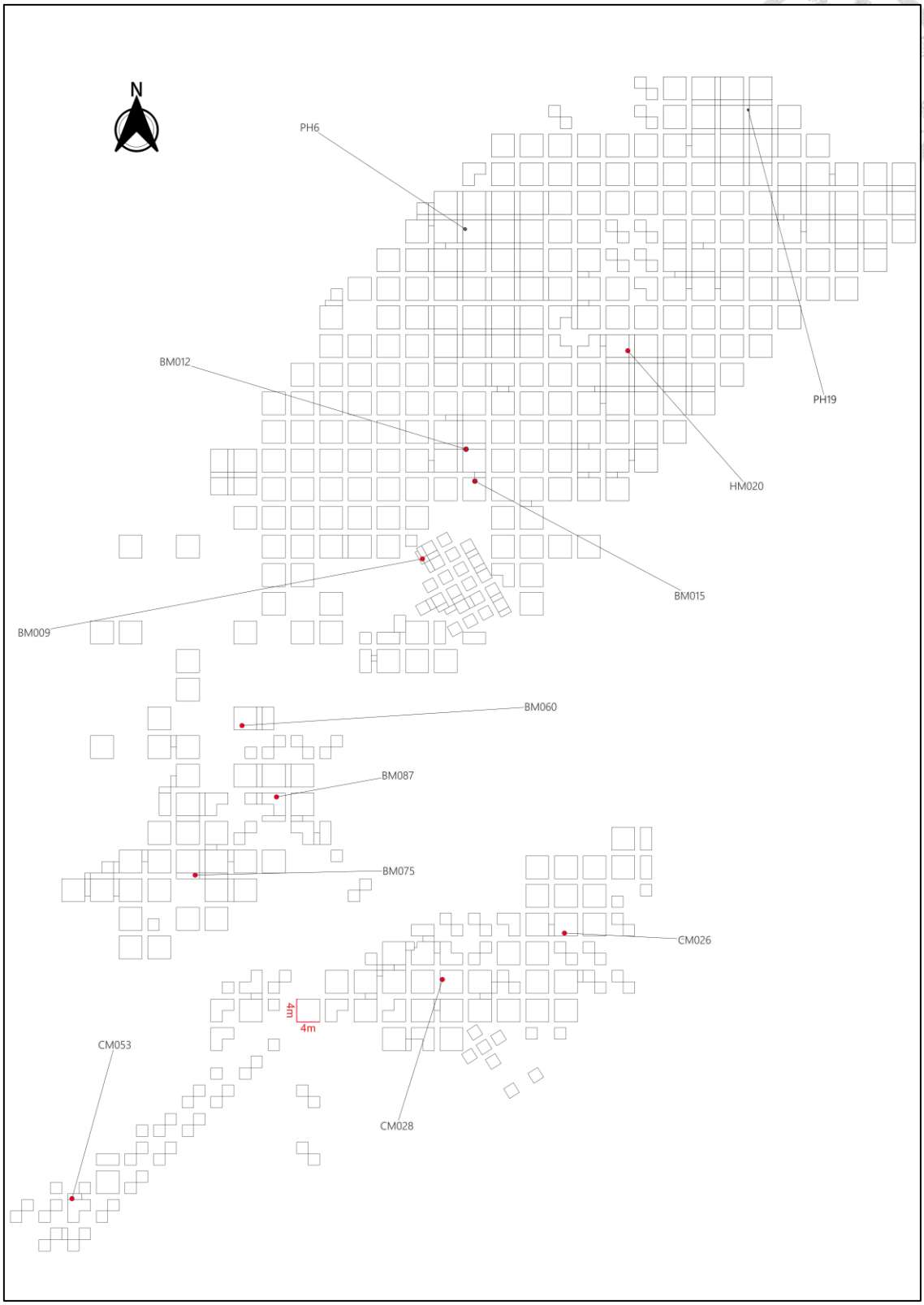

Figure 9. Map of the sources of the C14 samples. Image created by the author.

doi:10.6342/NTU202502709

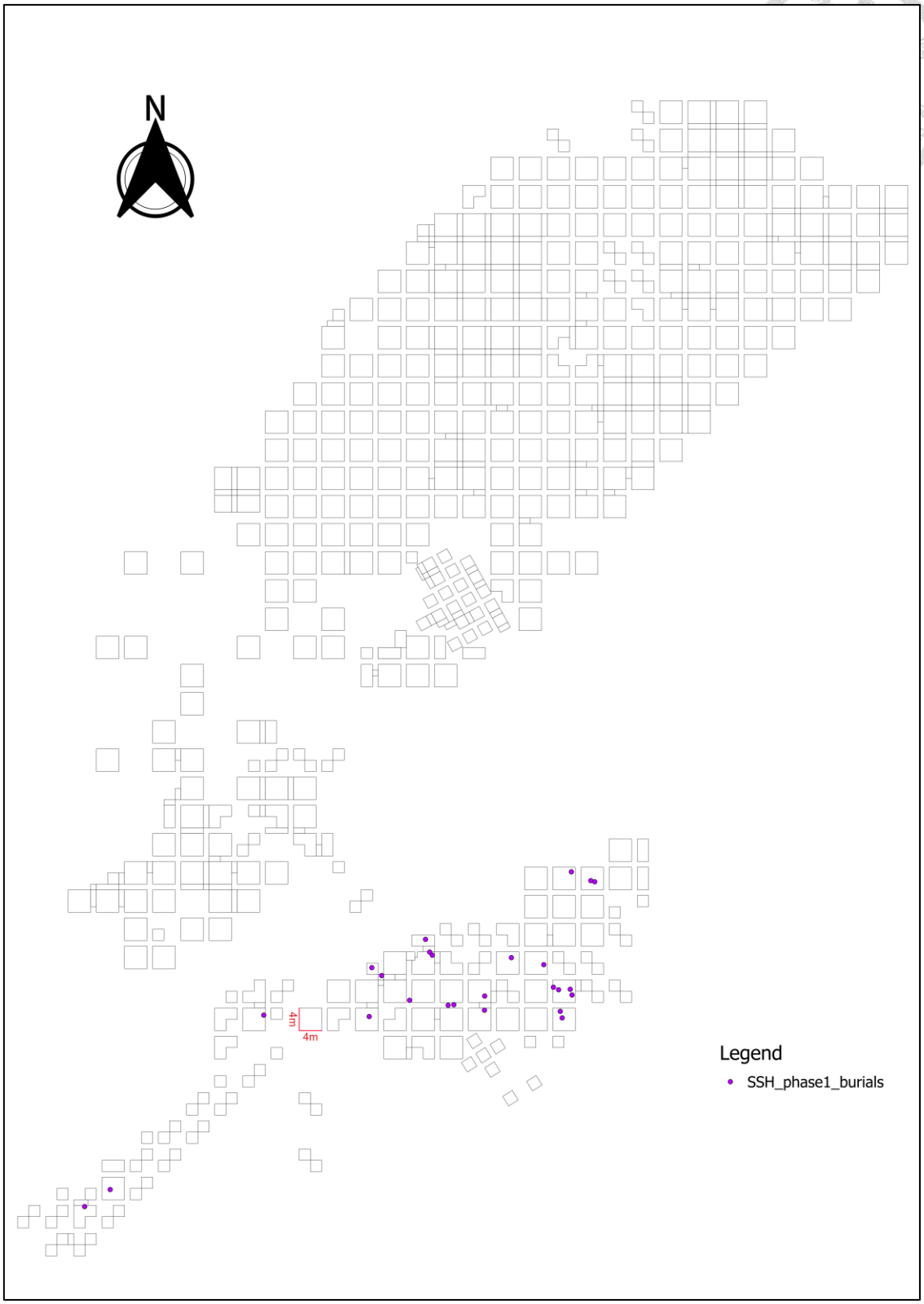

Figure 10. Distribution map of the graves from Phase 1 (N=25). Image created by the author.

doi:10.6342/NTU202502709

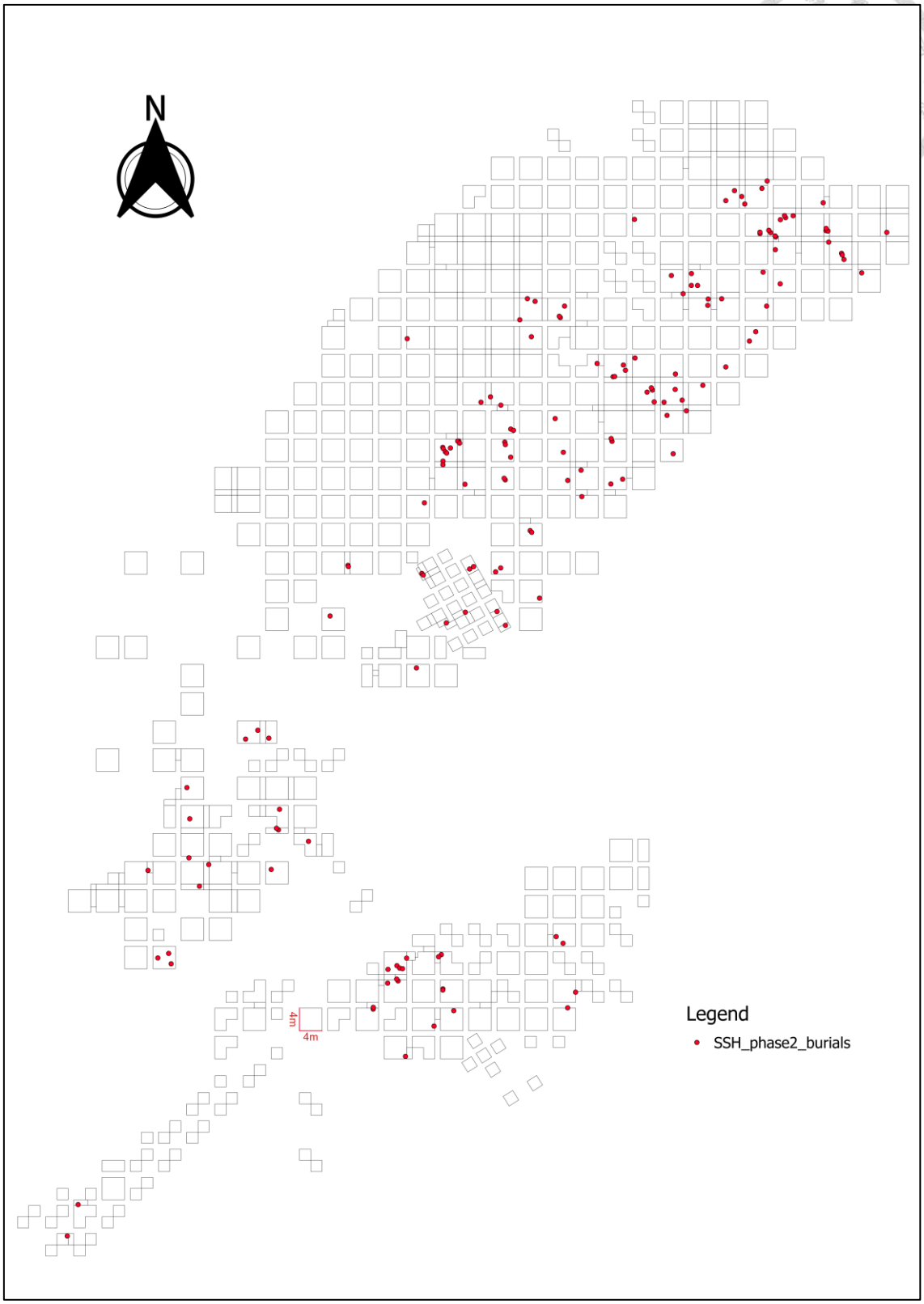

Figure 11. Distribution map of the graves from Phase 2 (N=156). Image created by the author.

doi:10.6342/NTU202502709

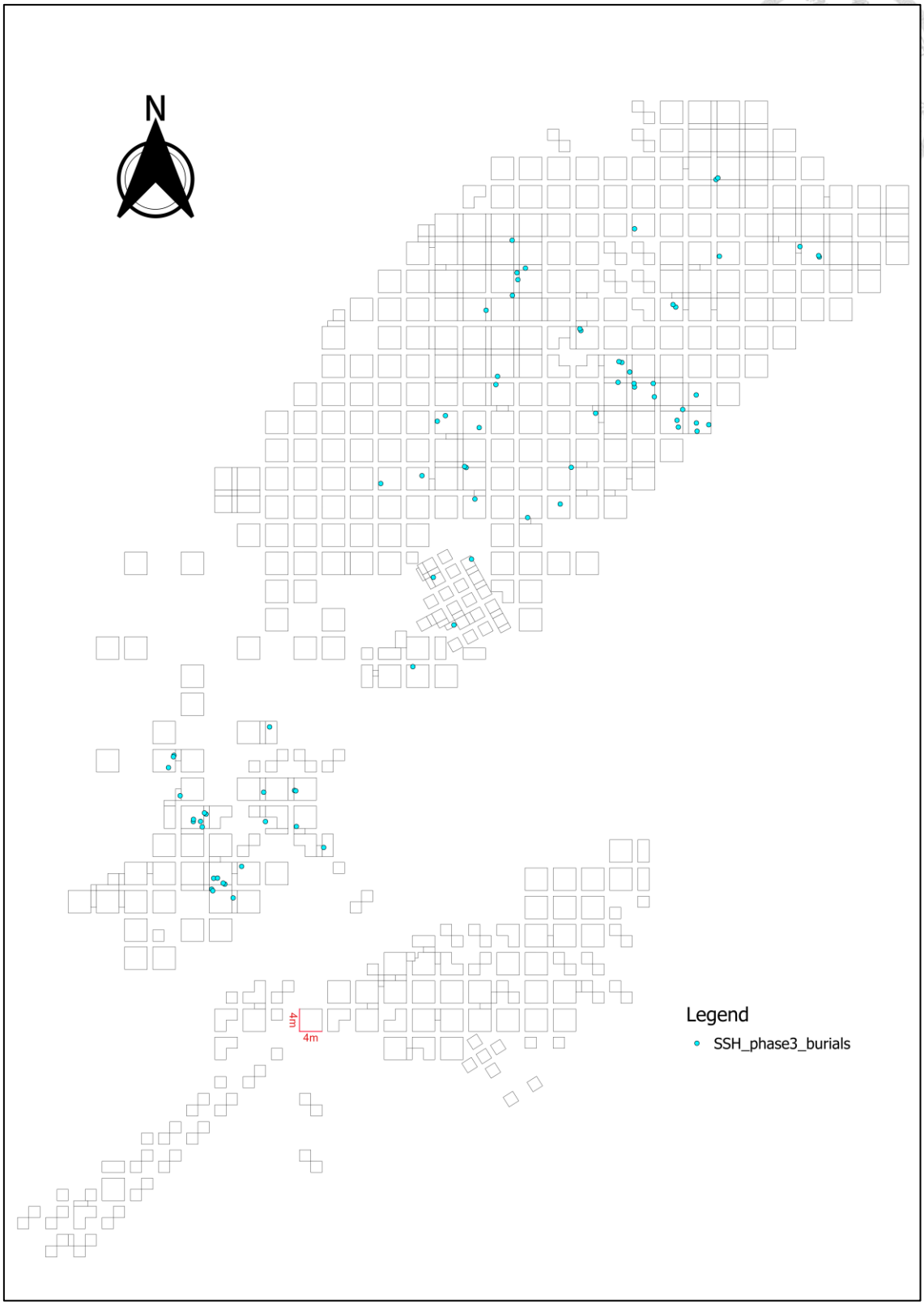

Figure 12. Distribution map of the graves from Phase 3 (N=75). Image created by the author.

doi:10.6342/NTU202502709

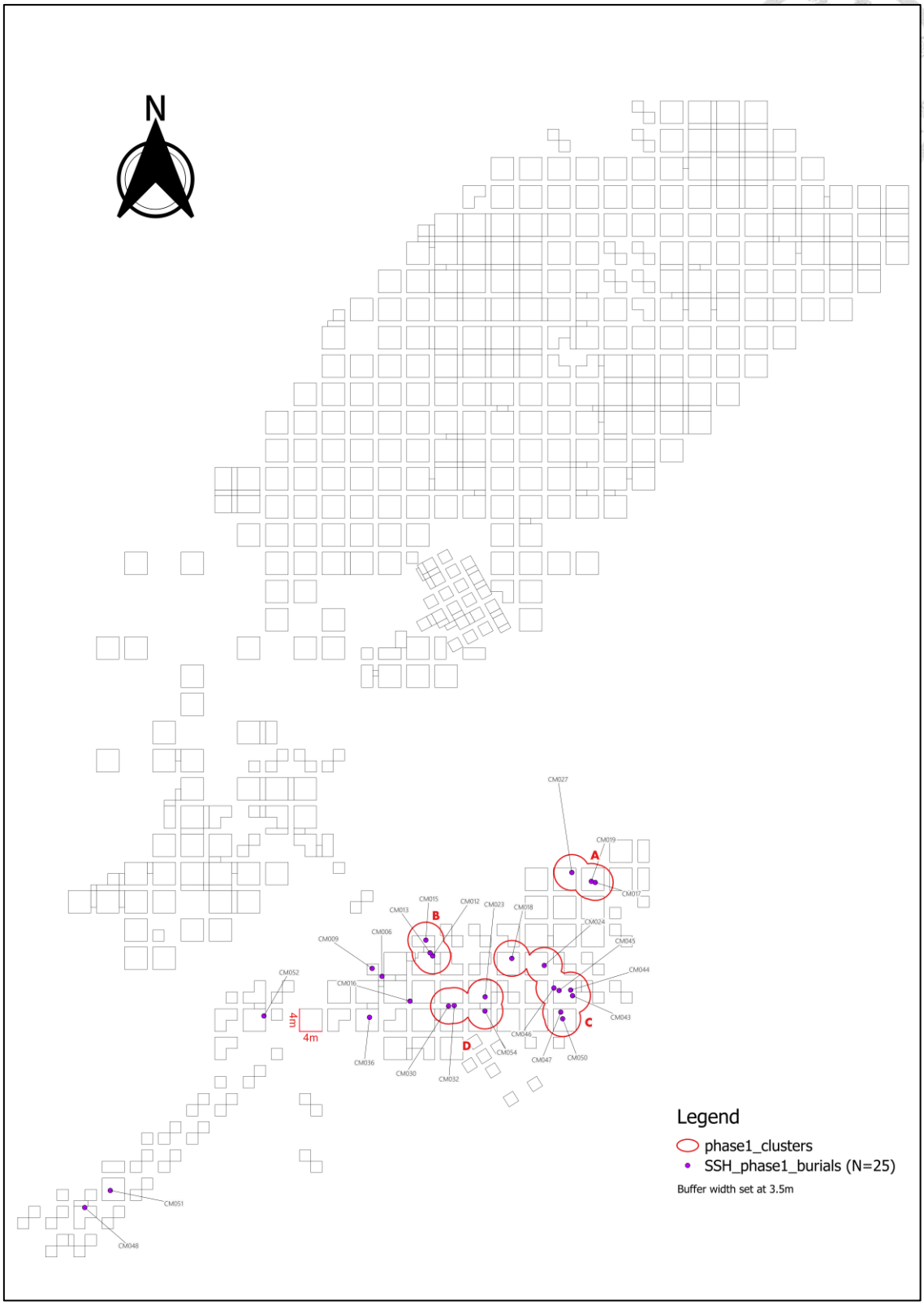

Figure 13. Map of the grave clusters from Phase 1. Image created by the author.

doi:10.6342/NTU202502709

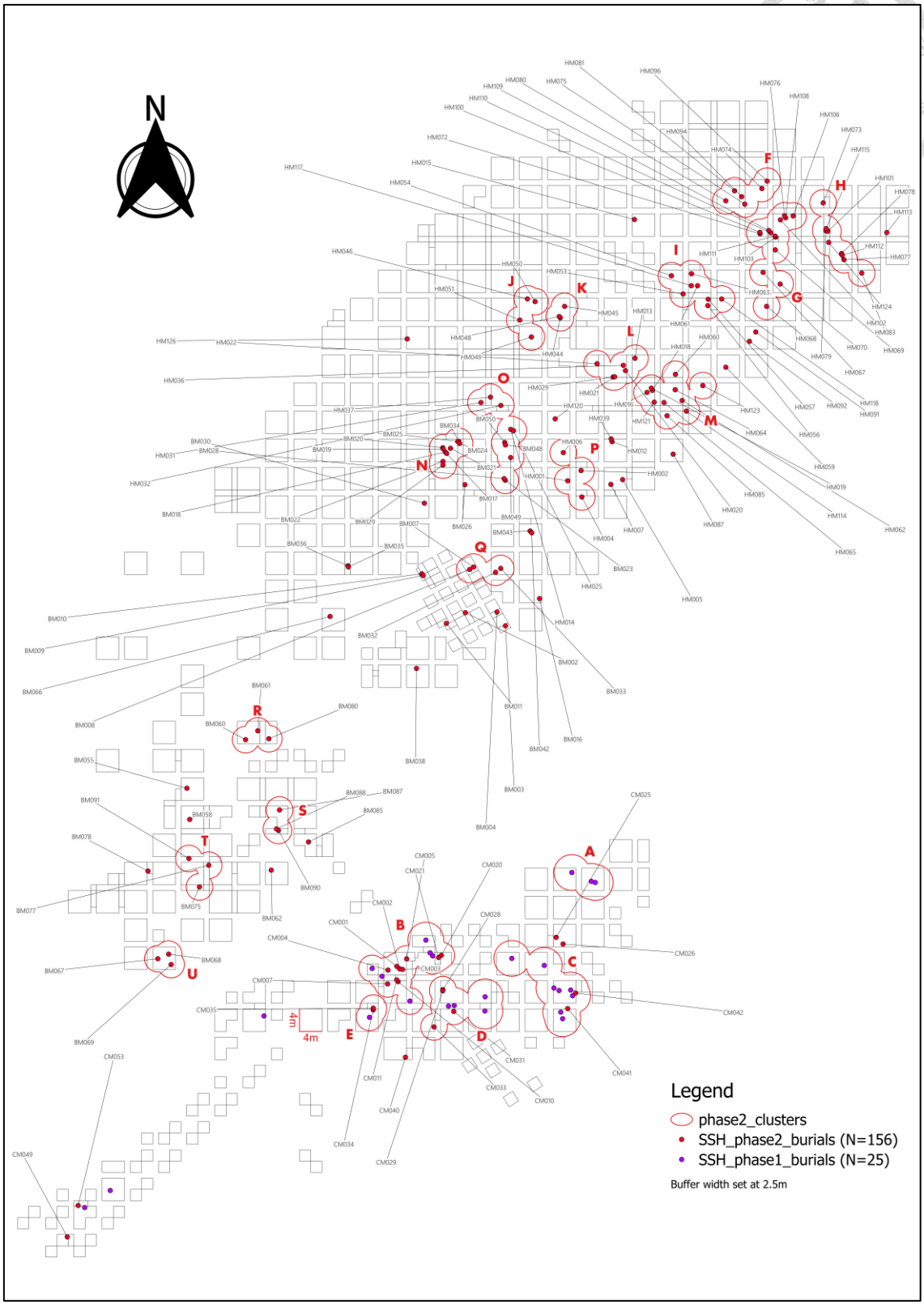

Figure 14. Map of the grave clusters from Phase 2. Image created by the author.

doi:10.6342/NTU202502709

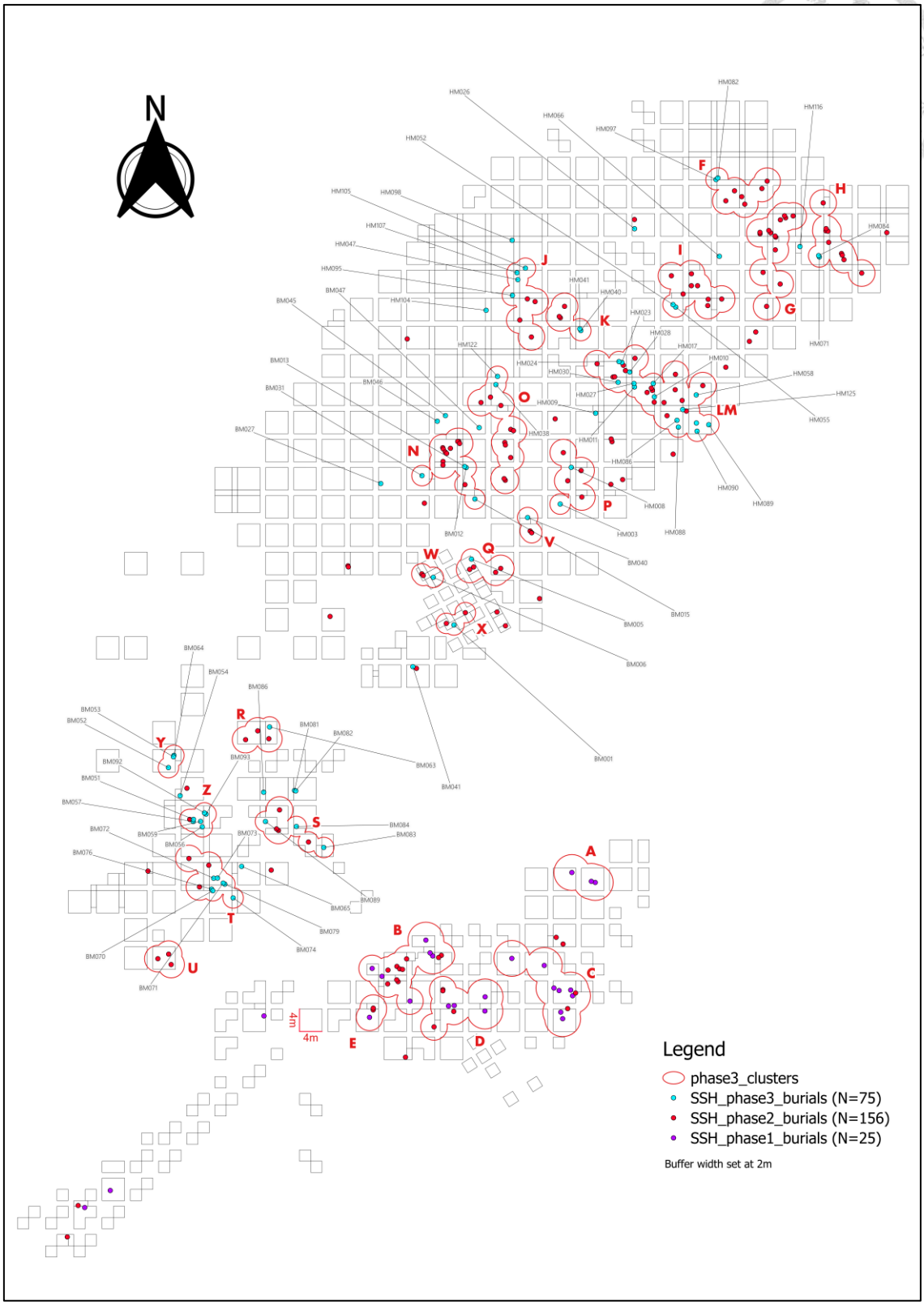

Figure 15. Map of the grave clusters from Phase 3. Image created by the author.

doi:10.6342/NTU202502709

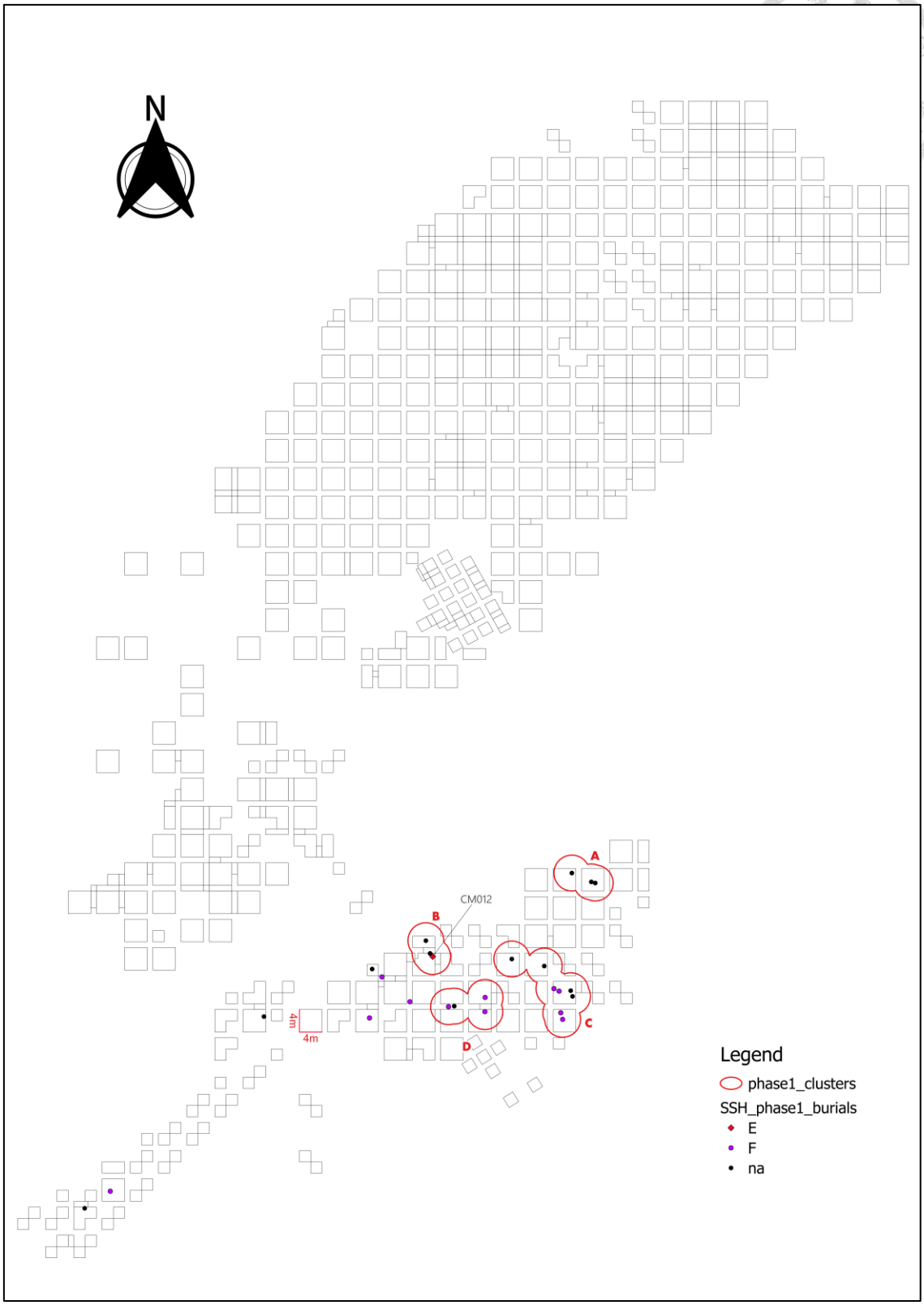

Figure 16. Map of the distribution of skeleton posture during Phase 1. Image created by the author.

doi:10.6342/NTU202502709

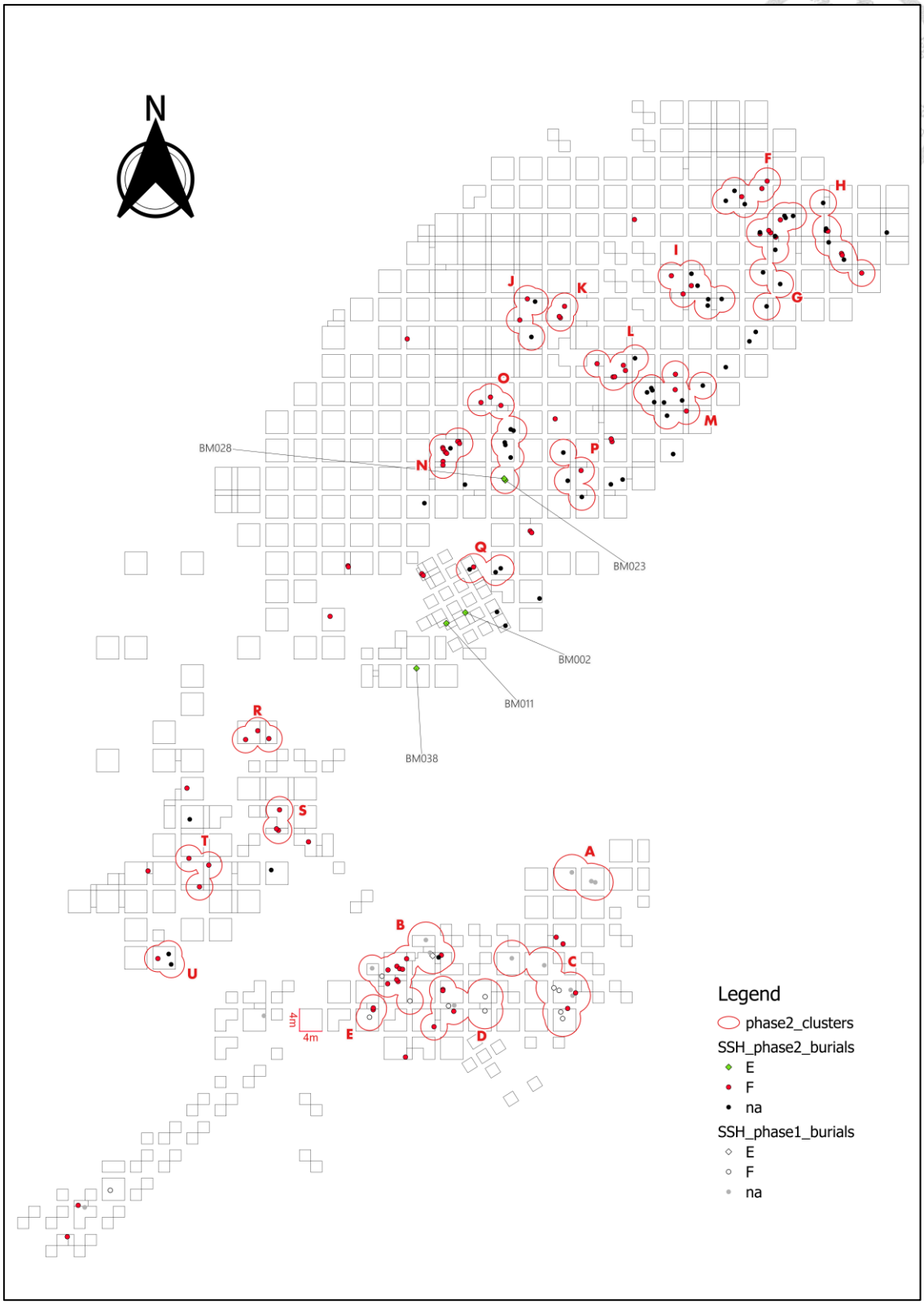

Figure 17. Map of the distribution of skeleton posture during Phase 2. Image created by the author.

doi:10.6342/NTU202502709

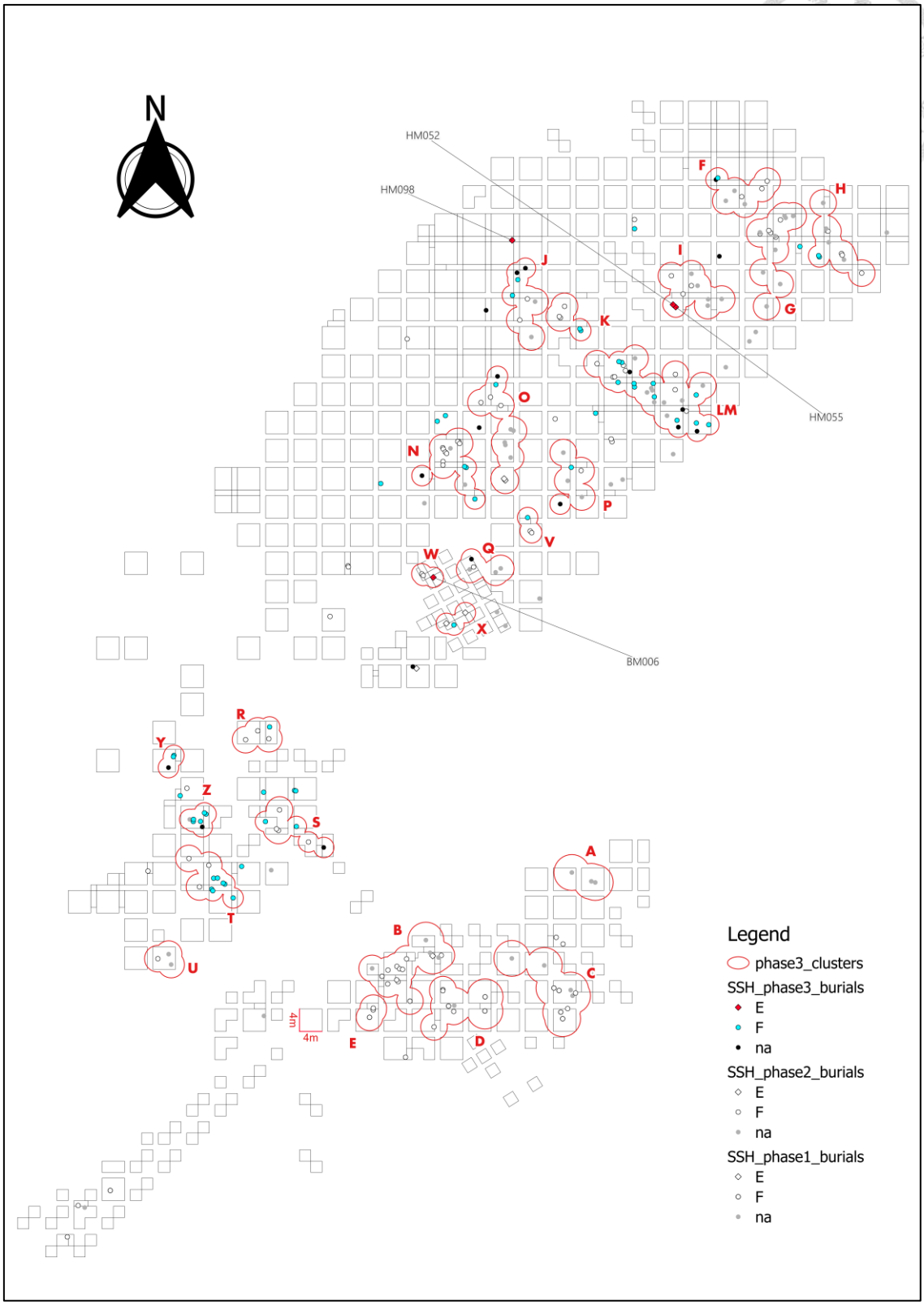

Figure 18. Map of the distribution of skeleton posture during Phase 3. Image created by the author.

doi:10.6342/NTU202502709

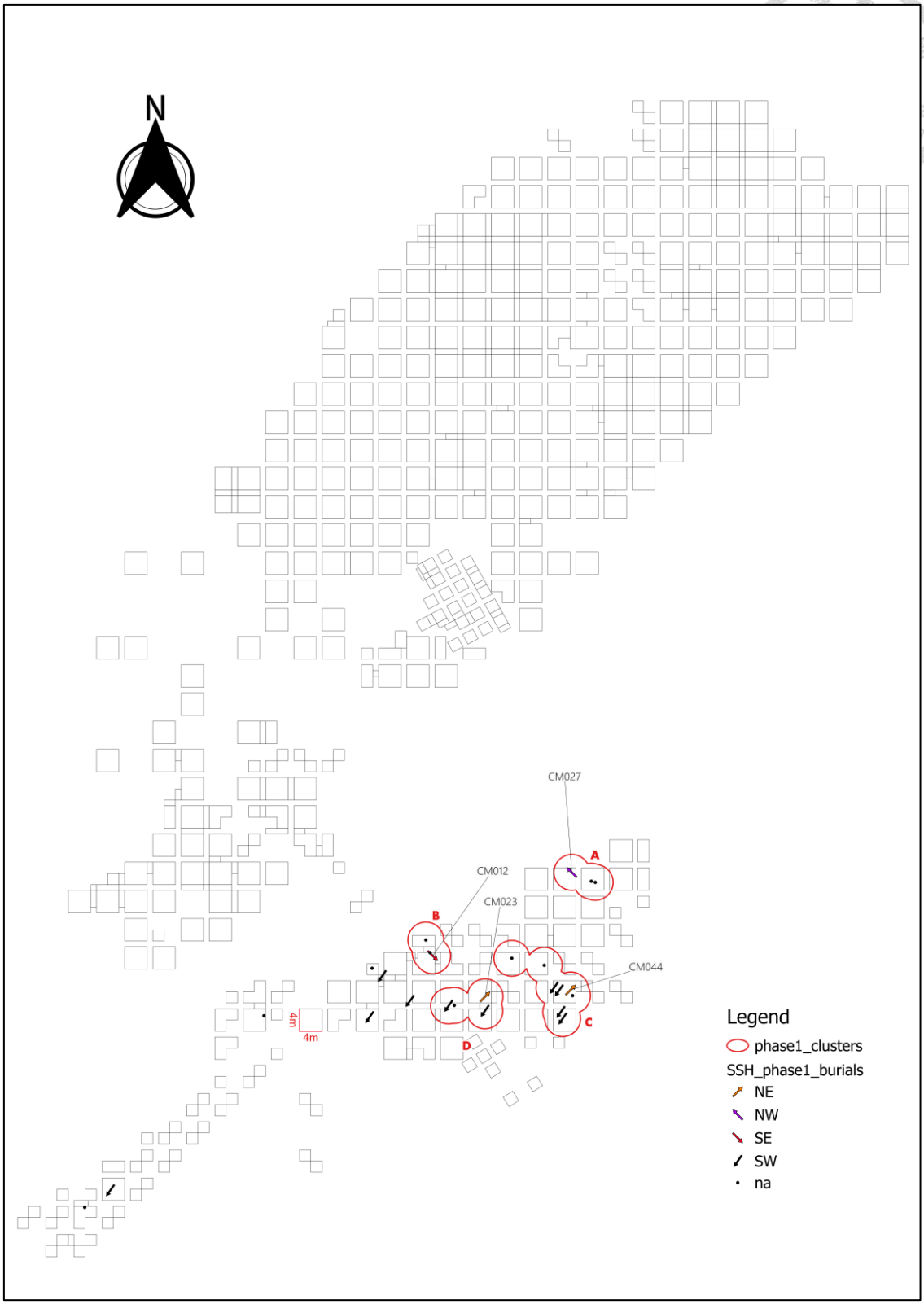

Figure 19. Map of the distribution of the orientation of the heads during Phase 1. Image created by the author.

doi:10.6342/NTU202502709

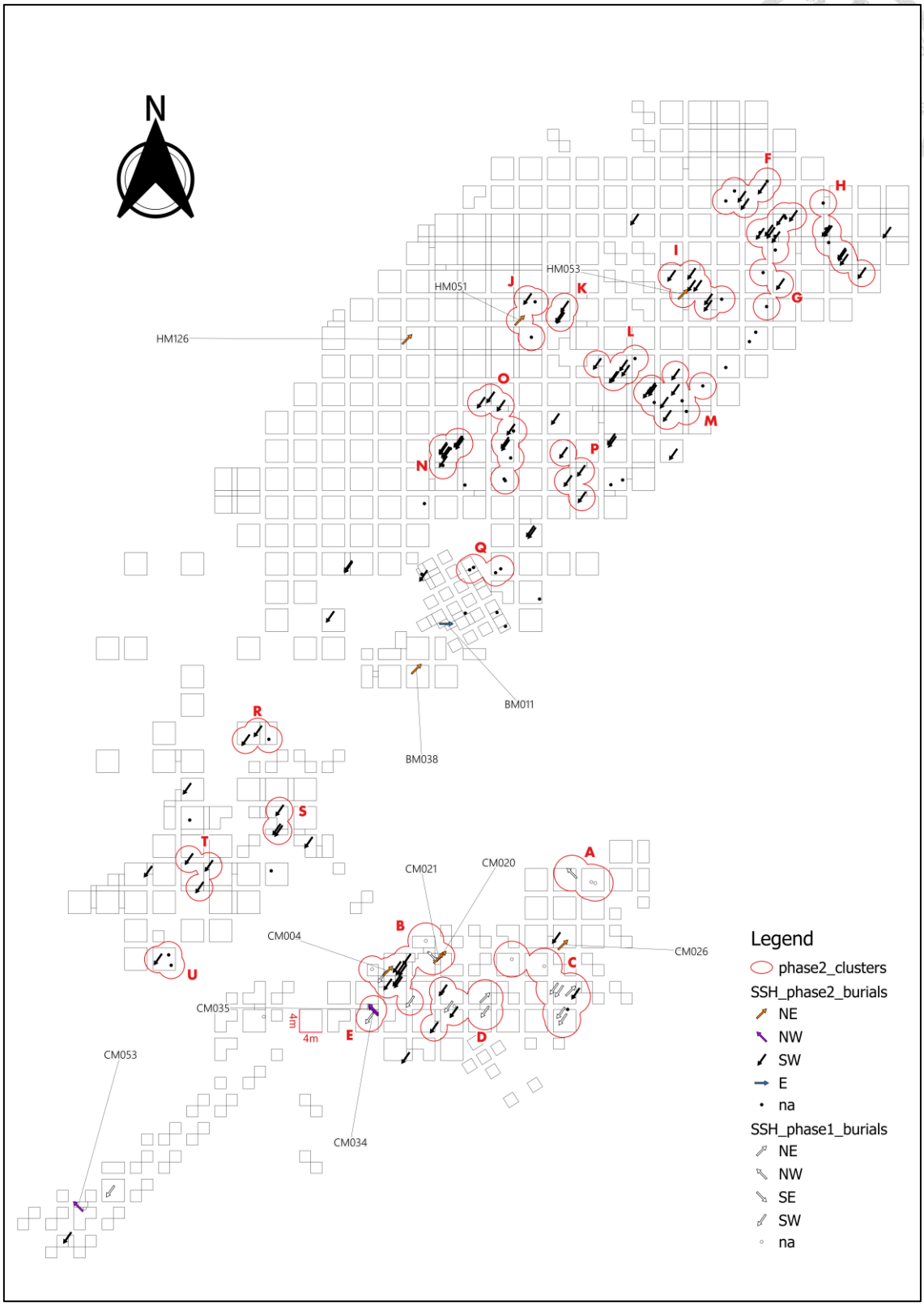

Figure 20. Map of the distribution of the orientation of the heads during Phase 2. Image created by the author.

doi:10.6342/NTU202502709

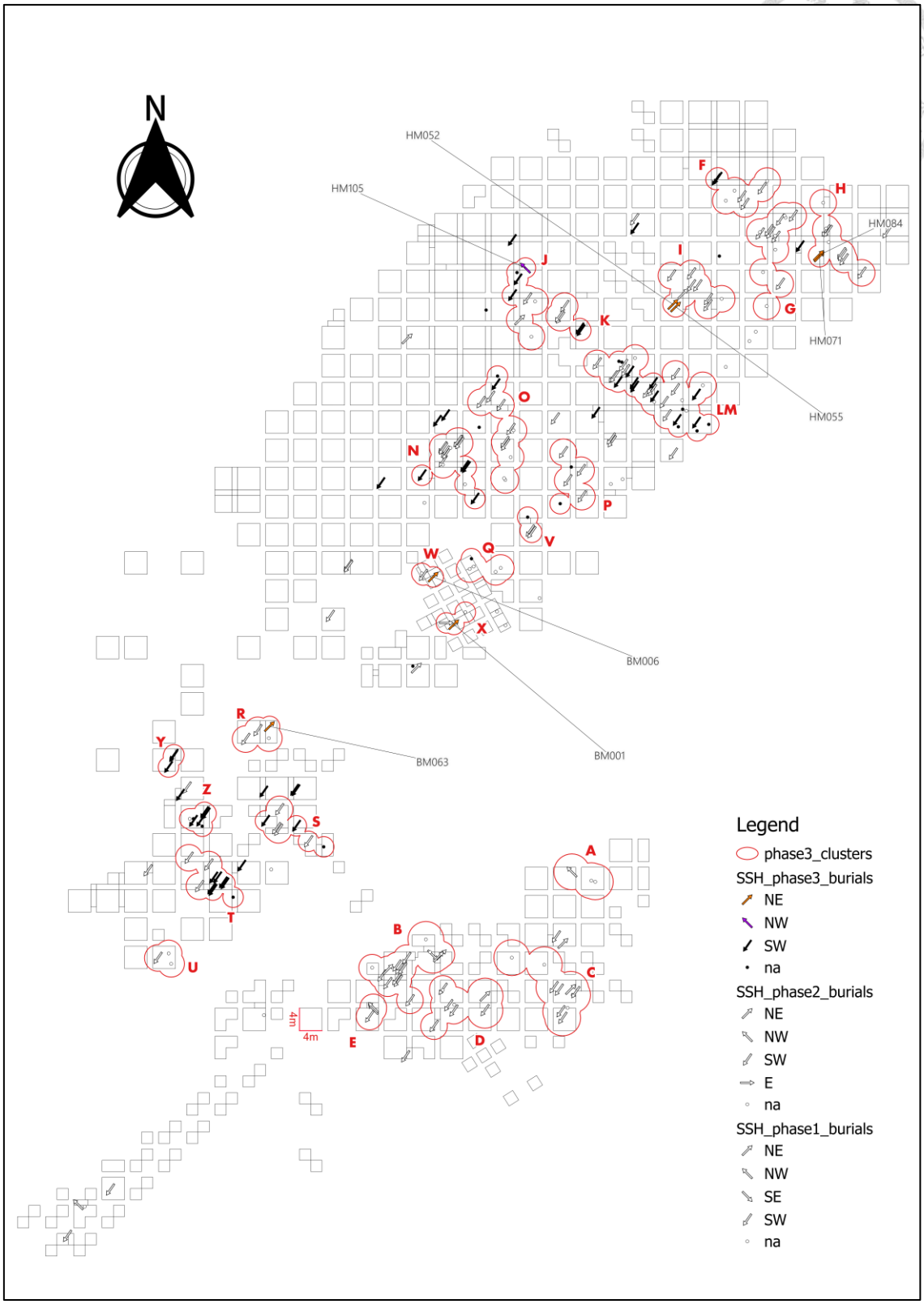

Figure 21. Map of the distribution of the orientation of the heads during Phase 3. Image created by the author.

doi:10.6342/NTU202502709

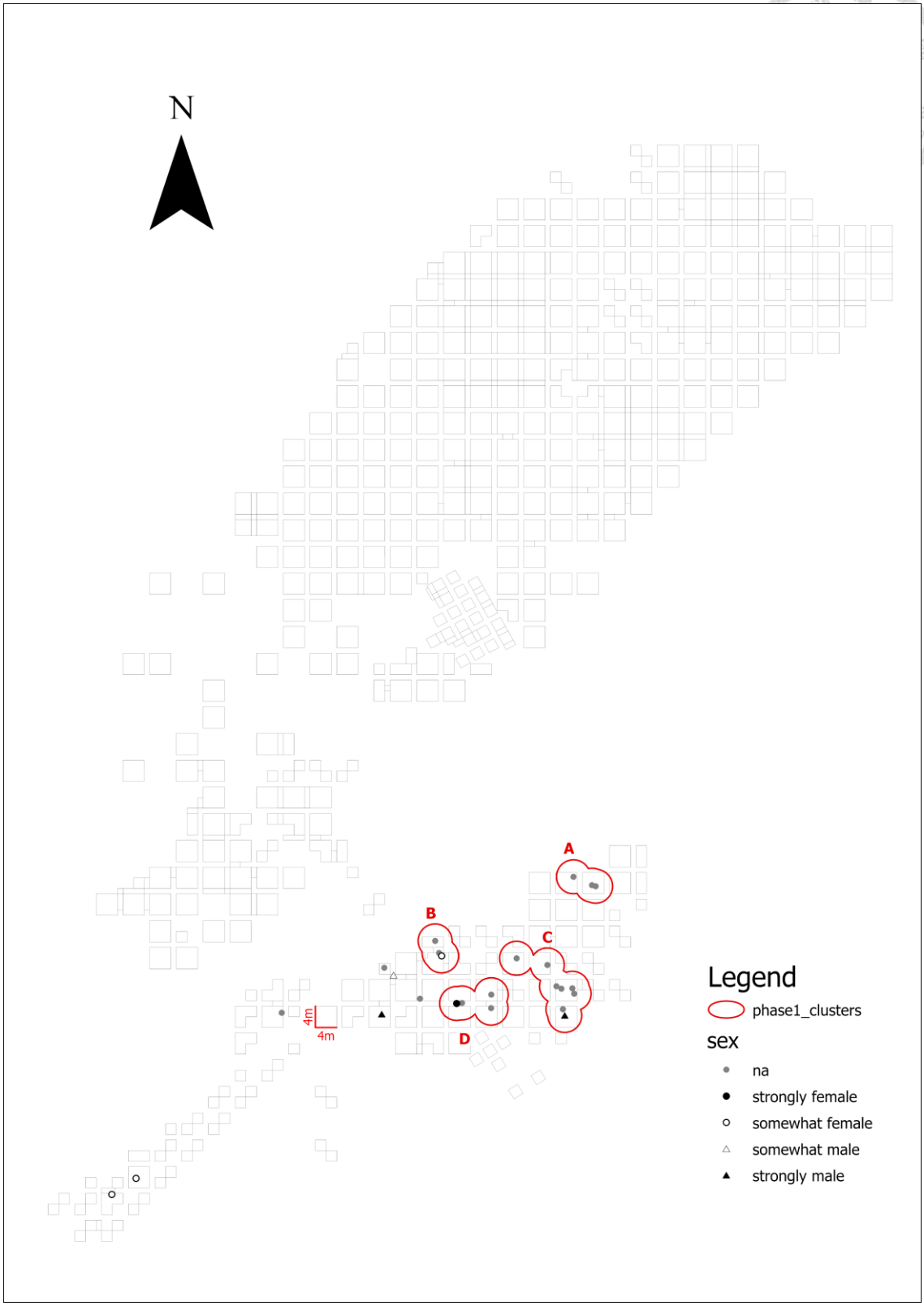

Figure 22. Map of the distribution of the skeletal sexual characteristics from Phase 1. Image created by the author.

doi:10.6342/NTU202502709

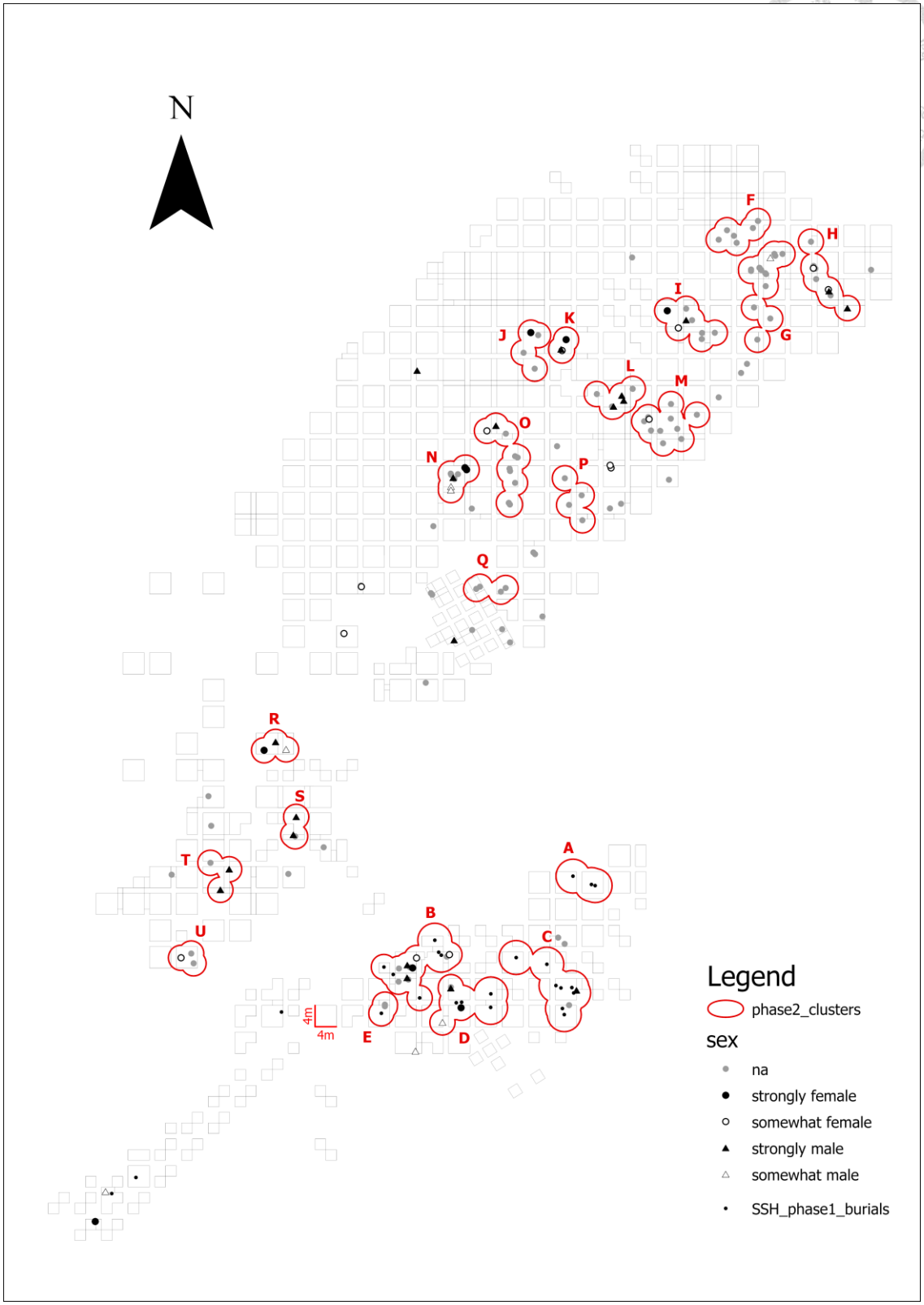

Figure 23. Map of the distribution of the skeletal sexual characteristics from Phase 2. Image created by the author.

doi:10.6342/NTU202502709

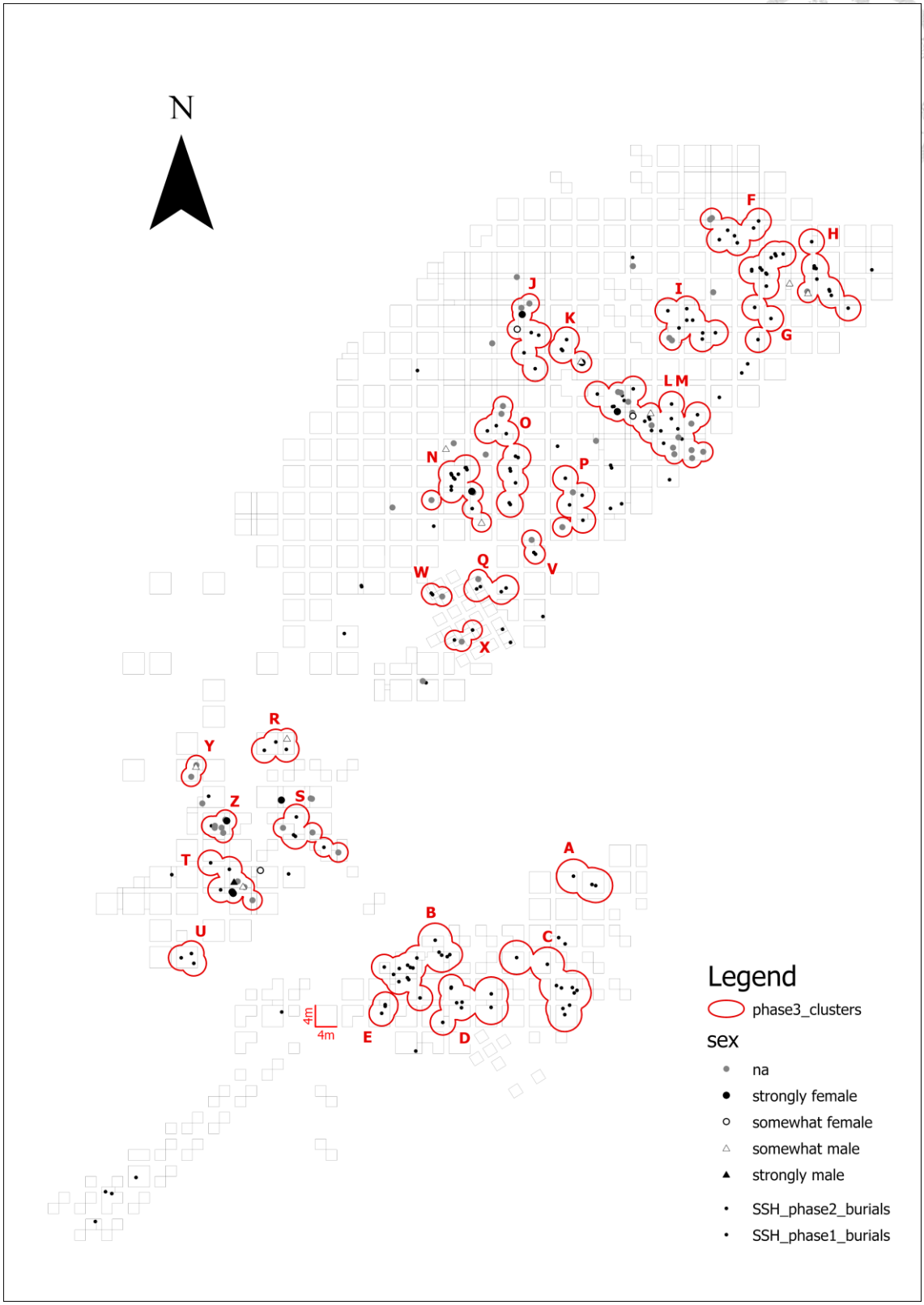

Figure 24. Map of the distribution of the skeletal sexual characteristics from Phase 3. Image created by the author.

doi:10.6342/NTU202502709

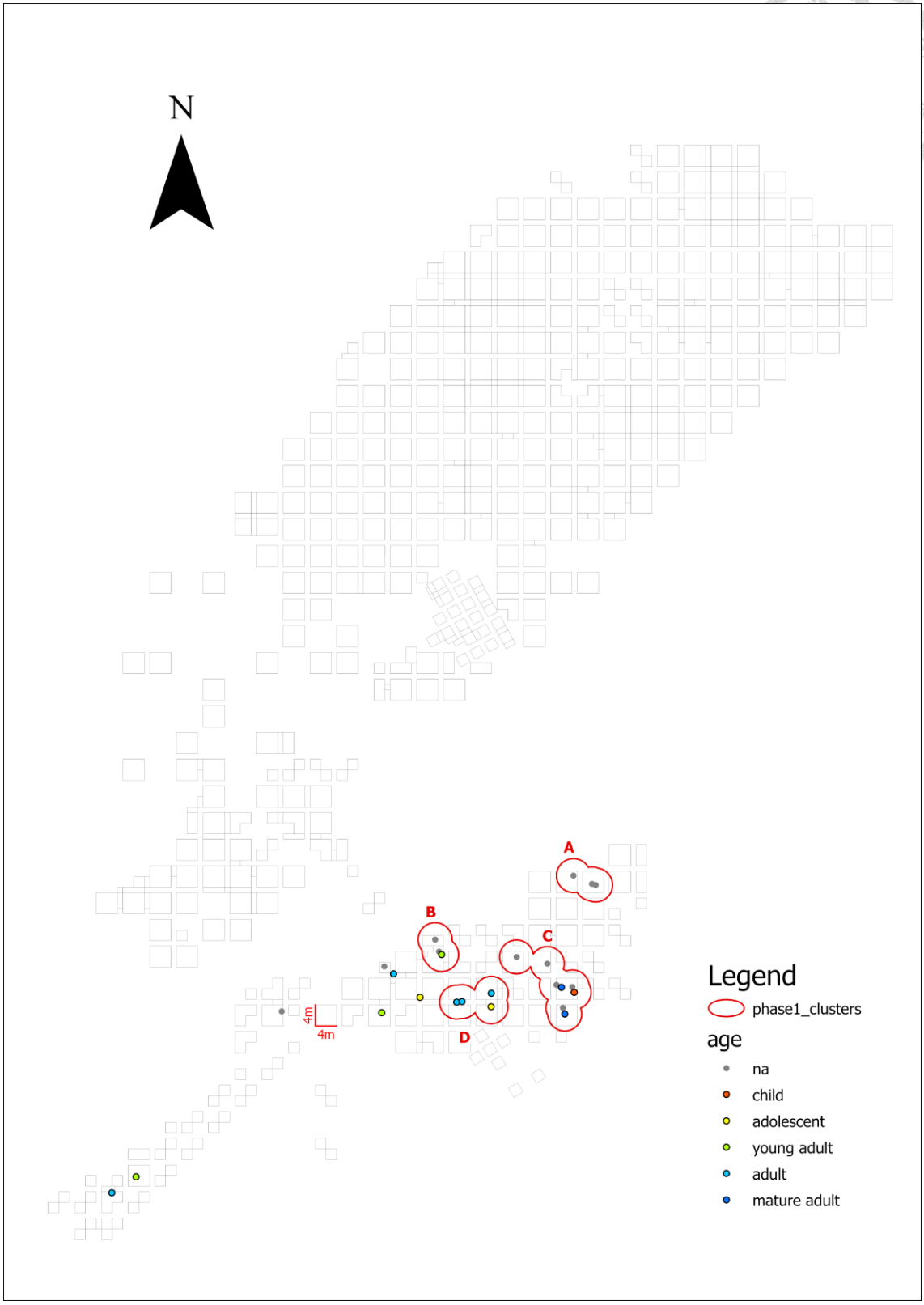

Figure 25. Map of the distribution of the skeletal ages from Phase 1. Image created by the author.

doi:10.6342/NTU202502709

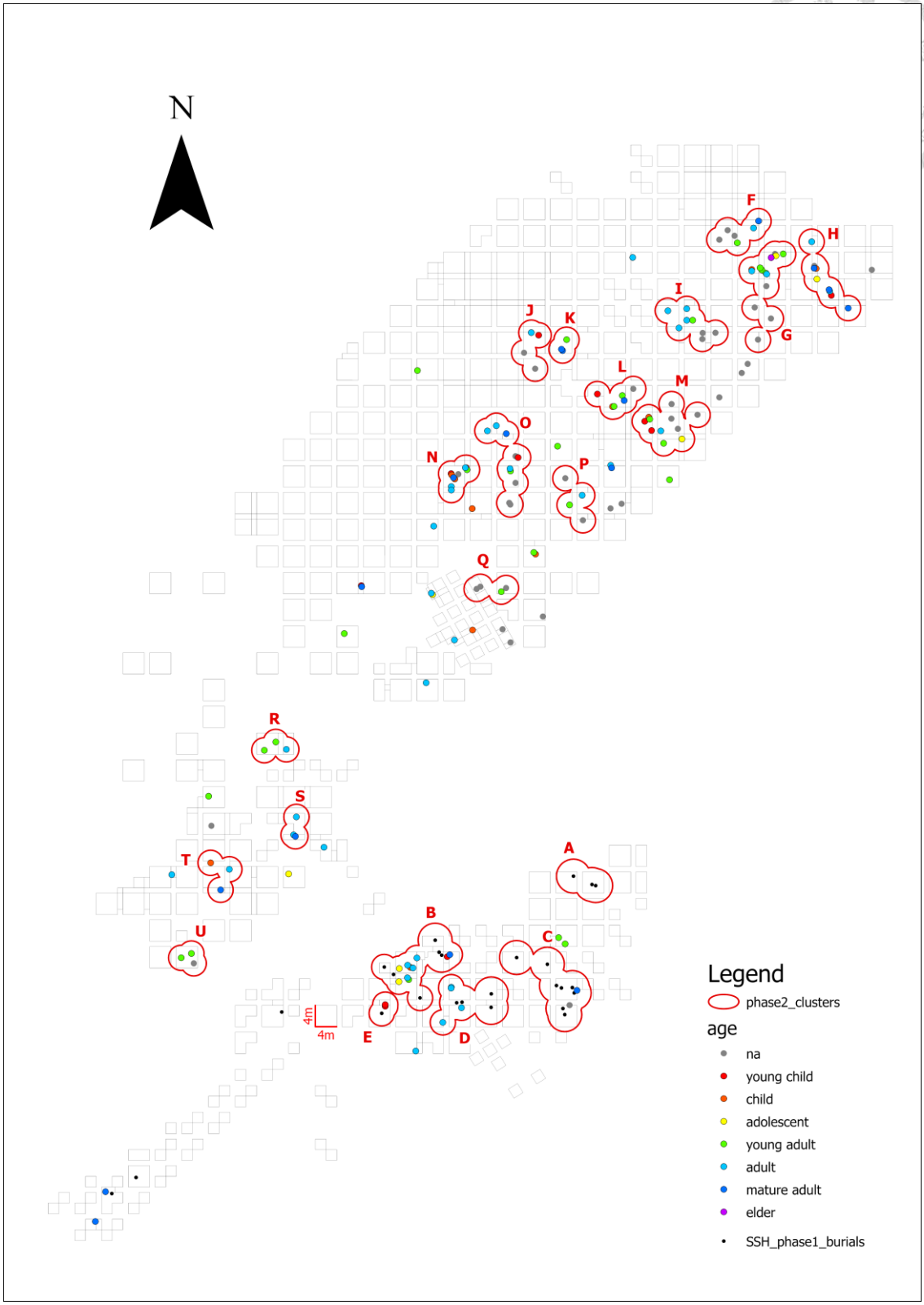

Figure 26. Map of the distribution of the skeletal ages from Phase 2. Image created by the author.

doi:10.6342/NTU202502709

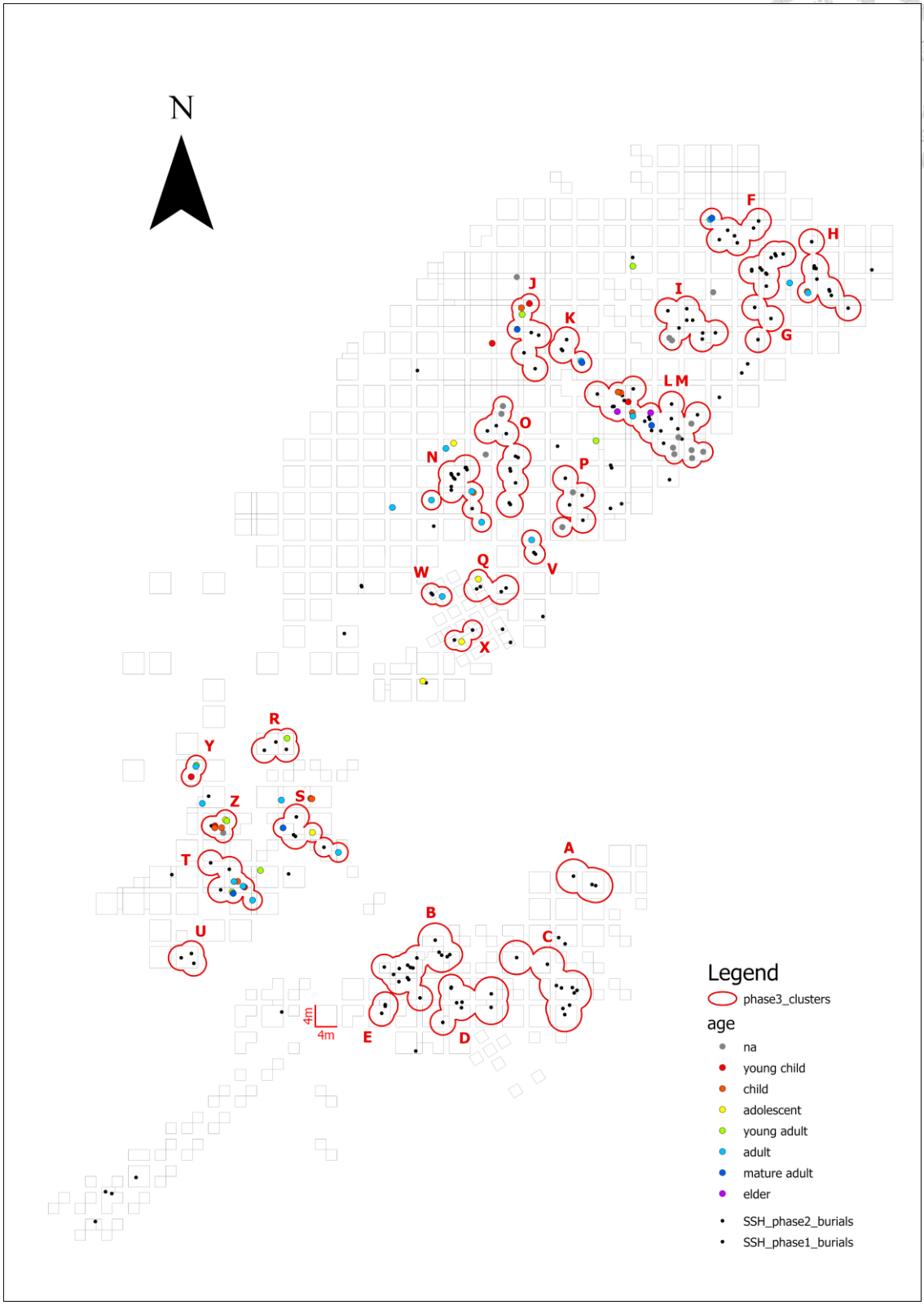

Figure 27. Map of the distribution of the skeletal ages from Phase 3. Image created by the author.

doi:10.6342/NTU202502709

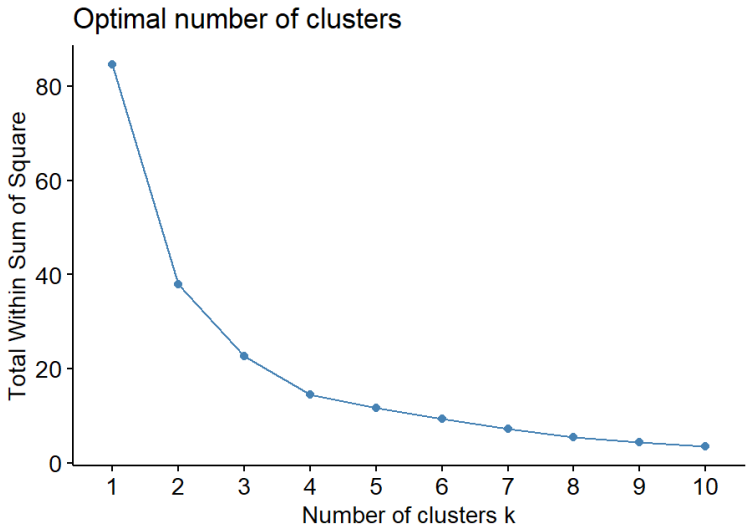

Figure 28. Plot of the within-cluster sum of squares for varying values of k in Phase 1. The elbow point (the optimal number of clusters) is observed at k = 3. Image created by the author.

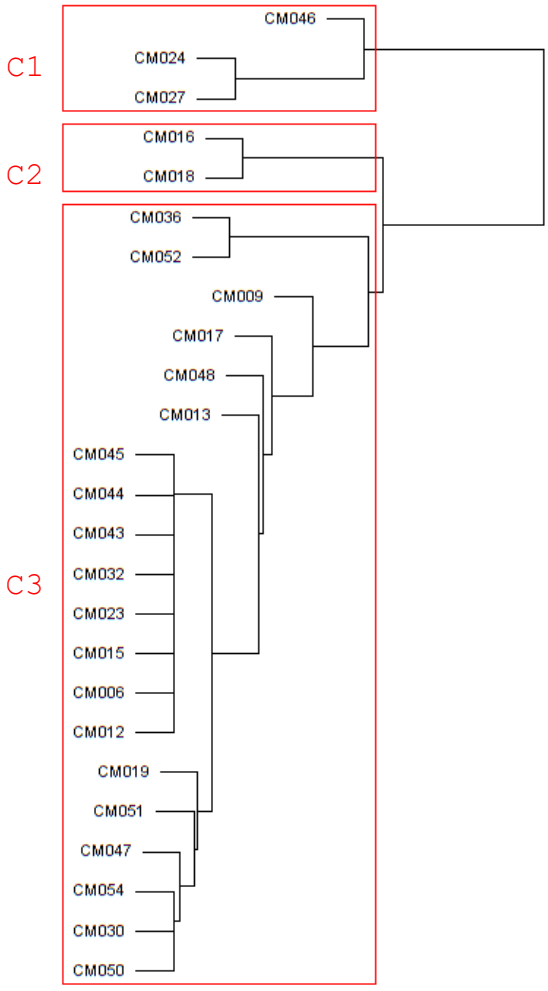

Figure 29. The grave goods clustering dendrogram of Phase 1 (N=25) as determined by cluster analysis. The labeled red boxes (C1 (n=3), C2 (n=2), and C3 (n=20)) illustrate the clusters identified based on the elbow point (the optimal number of clusters). Image created by the author.

doi:10.6342/NTU202502709

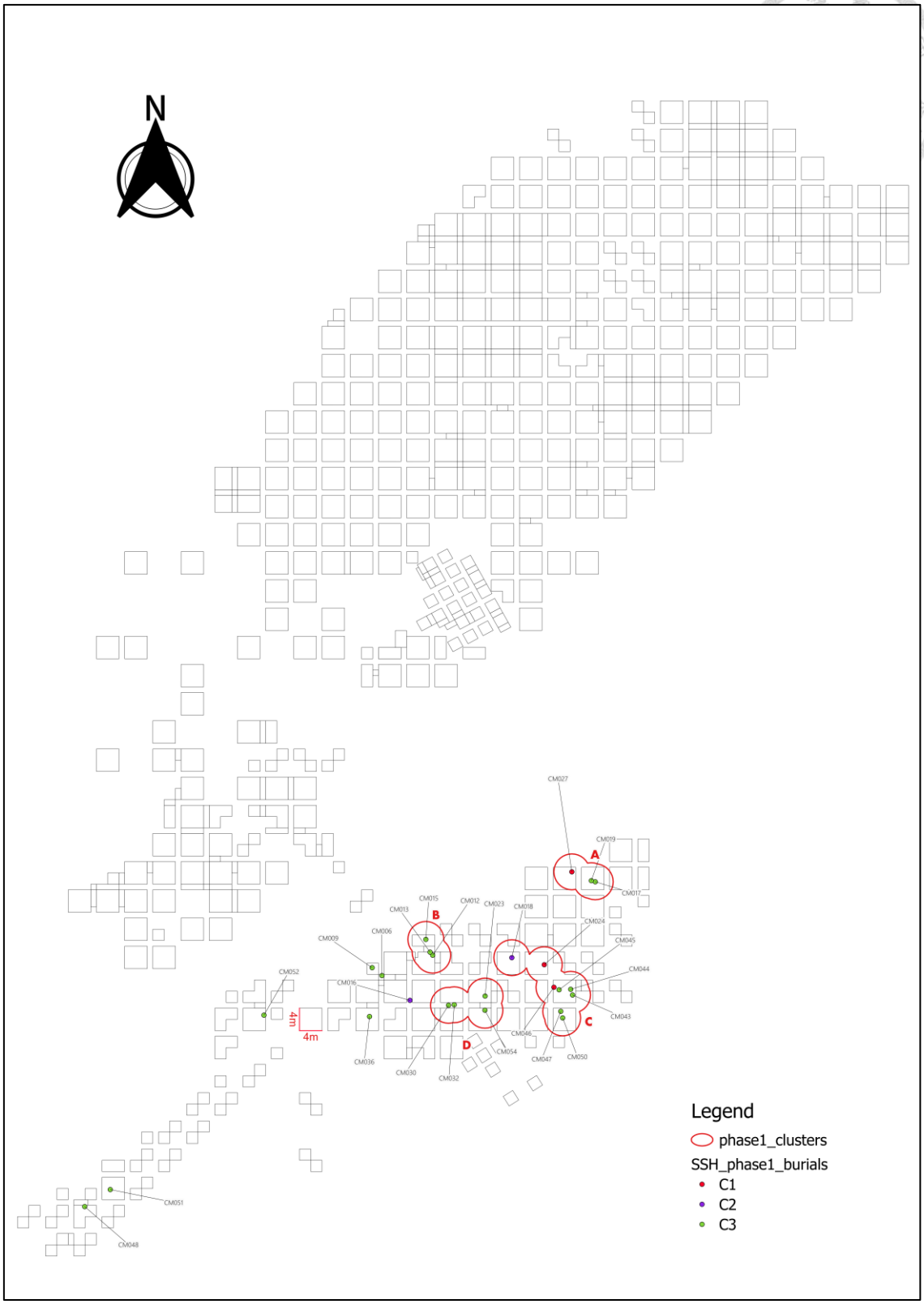

Figure 30. Map of the distribution of the graves belonging to different clusters (C1 (n=3), C2 (n=2), and C3 (n=20)) identified via cluster analysis in Phase 1. Image created by the author.

doi:10.6342/NTU202502709

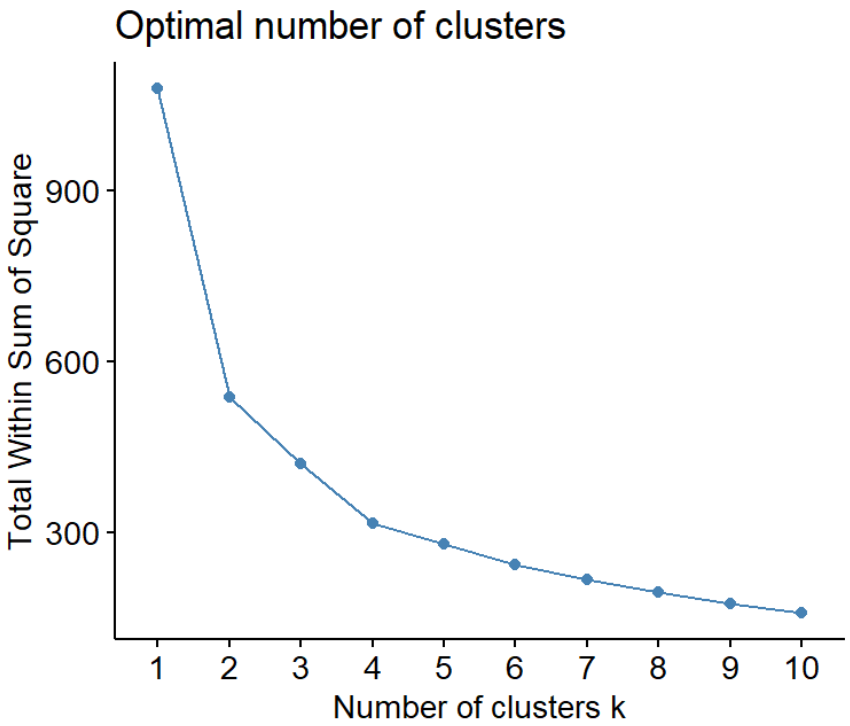

Figure 31. Plot of the within-cluster sum of squares for varying values of k in Phase 2. The elbow point (the optimal number of clusters) is observed at k = 3. Image created by the author.

doi:10.6342/NTU202502709

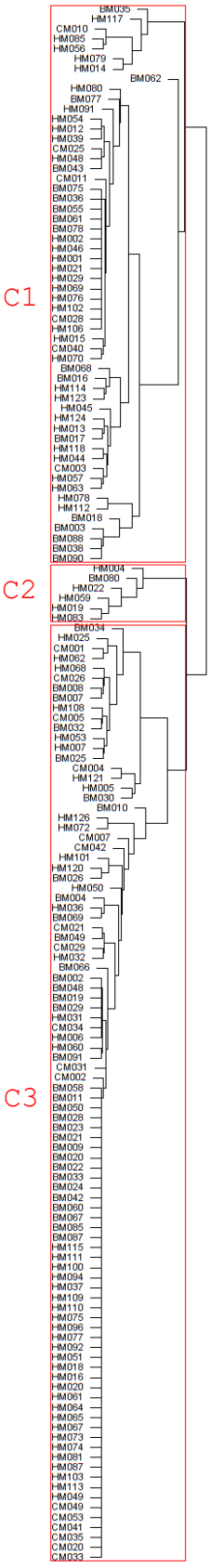

Figure 32. The grave goods clustering dendrogram of Phase 2 (N=156) as determined by cluster analysis. The labeled red boxes (C1 (n=56), C2 (n=6), and C3 (n=94)) illustrate the clusters identified based on the elbow point (the optimal number of clusters). Image created by the author.

doi:10.6342/NTU202502709

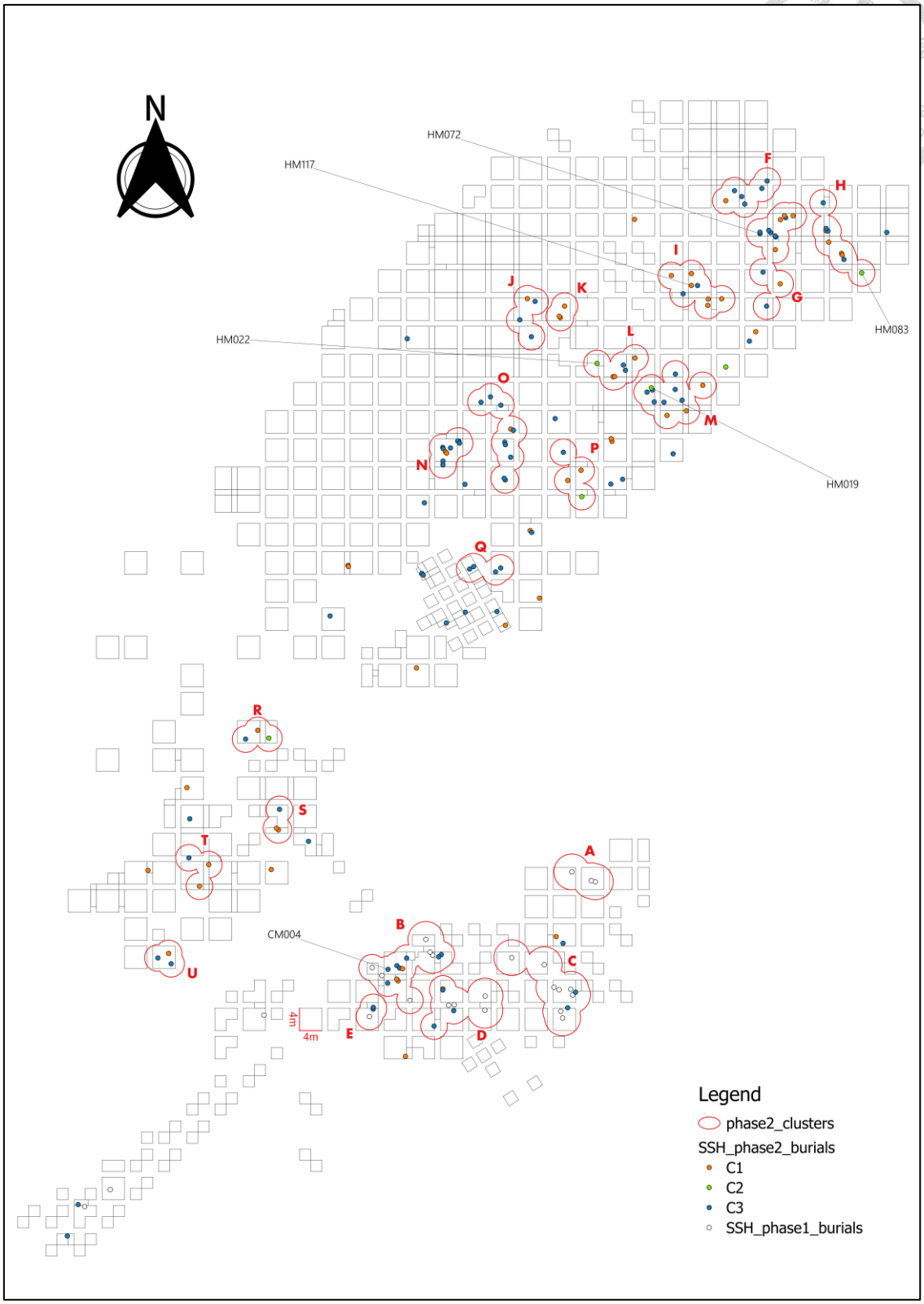

Figure 33. Map of the distribution of the graves belonging to different clusters (C1 (n=56), C2 (n=6), and C3 (n=94)) identified via cluster analysis in Phase 2, with statistical exceptions labelled only. Image created by the author.

doi:10.6342/NTU202502709

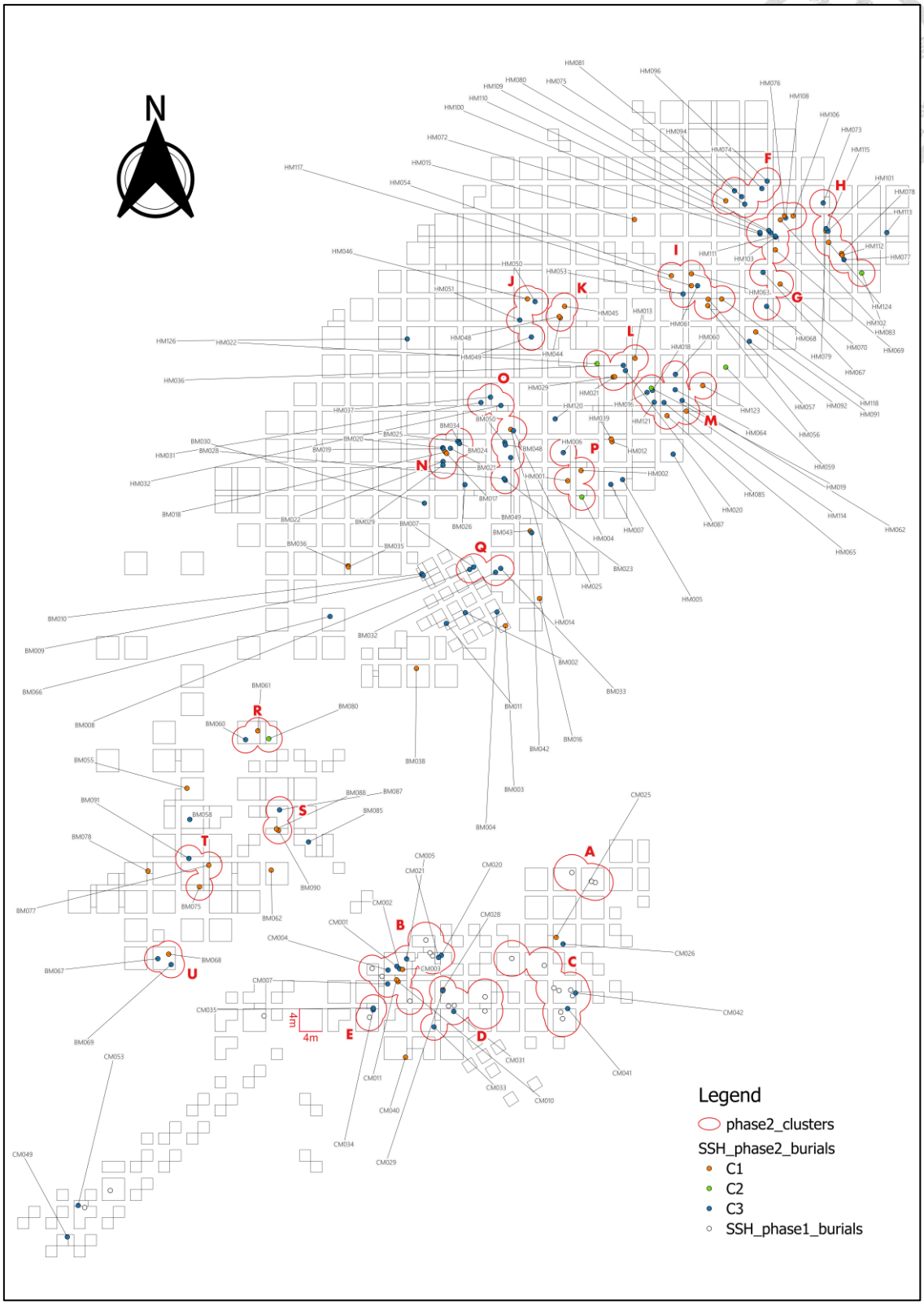

Figure 34. Map of the distribution of the graves belonging to different clusters (C1 (n=56), C2 (n=6), and C3 (n=94)) identified via cluster analysis in Phase 2, with the name of each grave labelled. Image created by the author.

doi:10.6342/NTU202502709

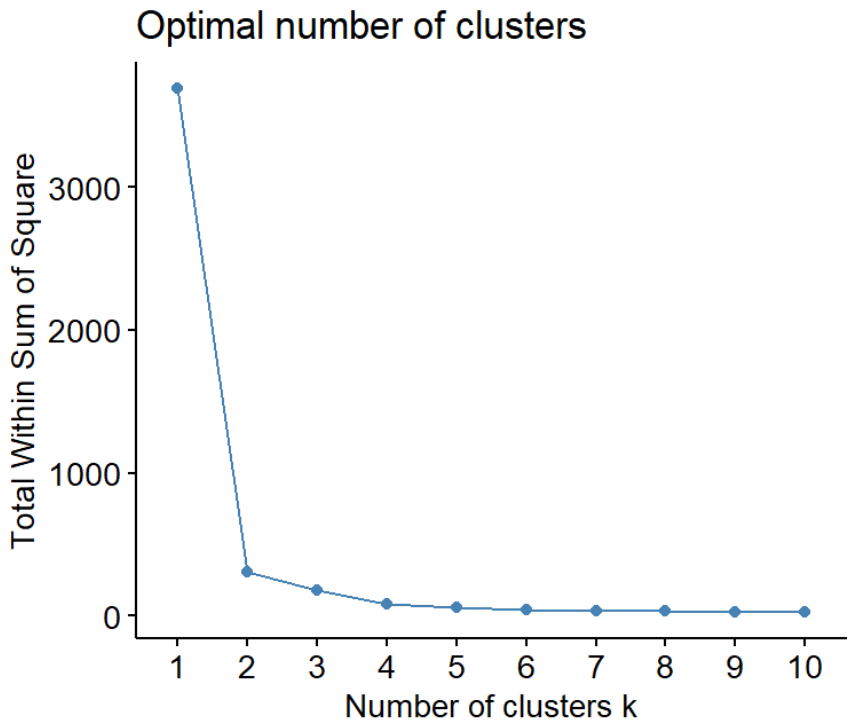

Figure 35. Plot of the within-cluster sum of squares for varying values of k in Phase 3. The elbow point (the optimal number of clusters) is observed at k = 2. Image created by the author.

doi:10.6342/NTU202502709

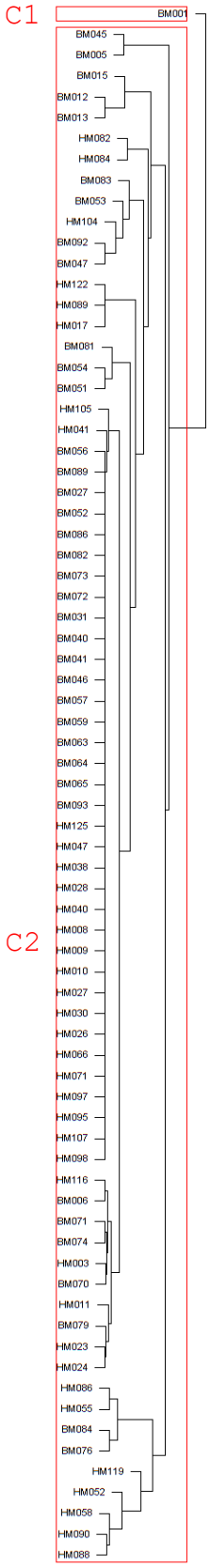

Figure 36. The grave goods clustering dendrogram of Phase 3 (N=75) as determined by cluster analysis. The labeled red boxes (C1 (n=1) and C2 (n=74)) illustrate the clusters identified based on the elbow point (the optimal number of clusters). Image created by the author.

doi:10.6342/NTU202502709

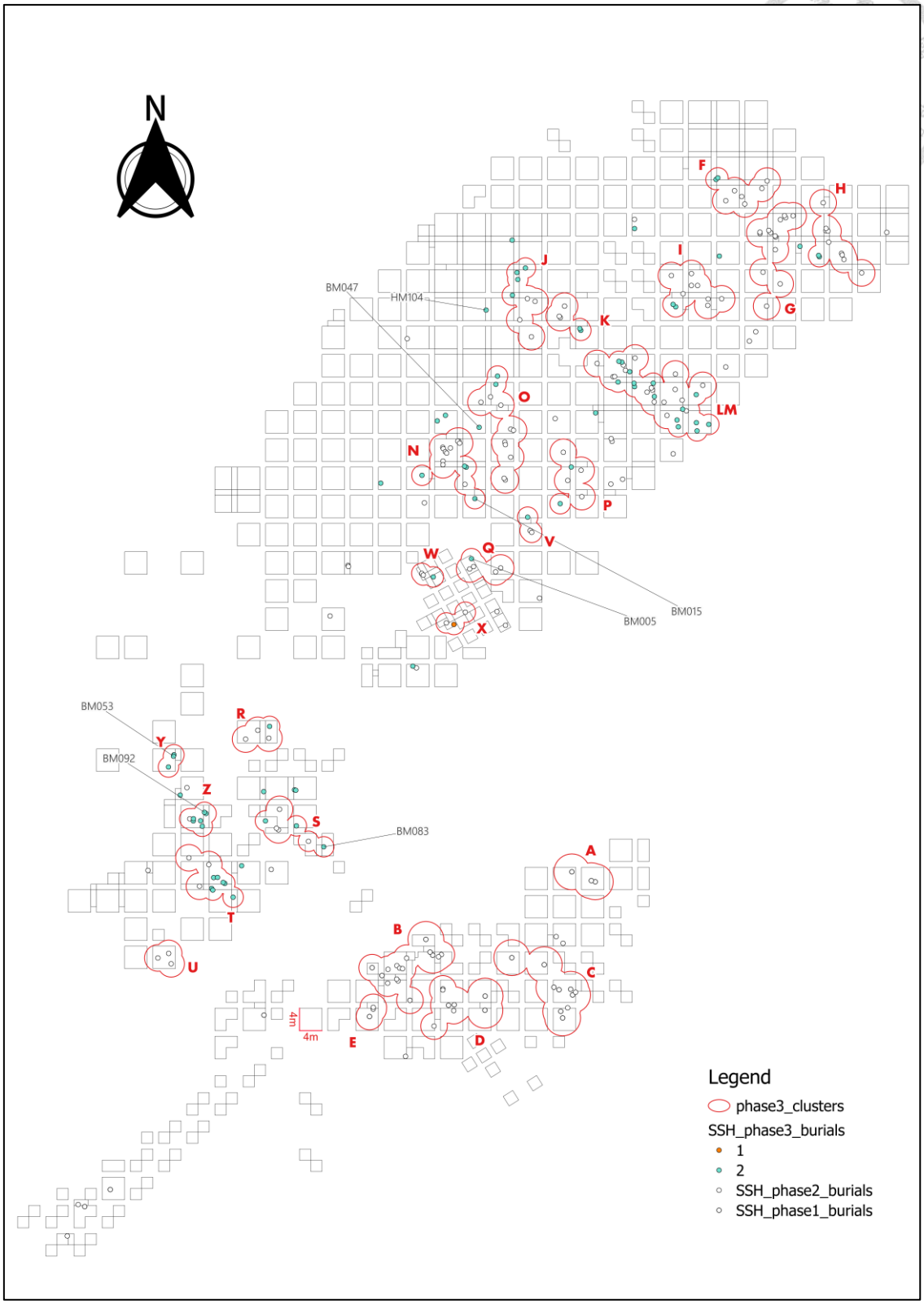

Figure 37. Map of the distribution of the graves belonging to different clusters (C1 (n=1) and C2 (n=74)) identified via cluster analysis in Phase 3, with the graves containing pottery labeled only. Image created by the author.

doi:10.6342/NTU202502709

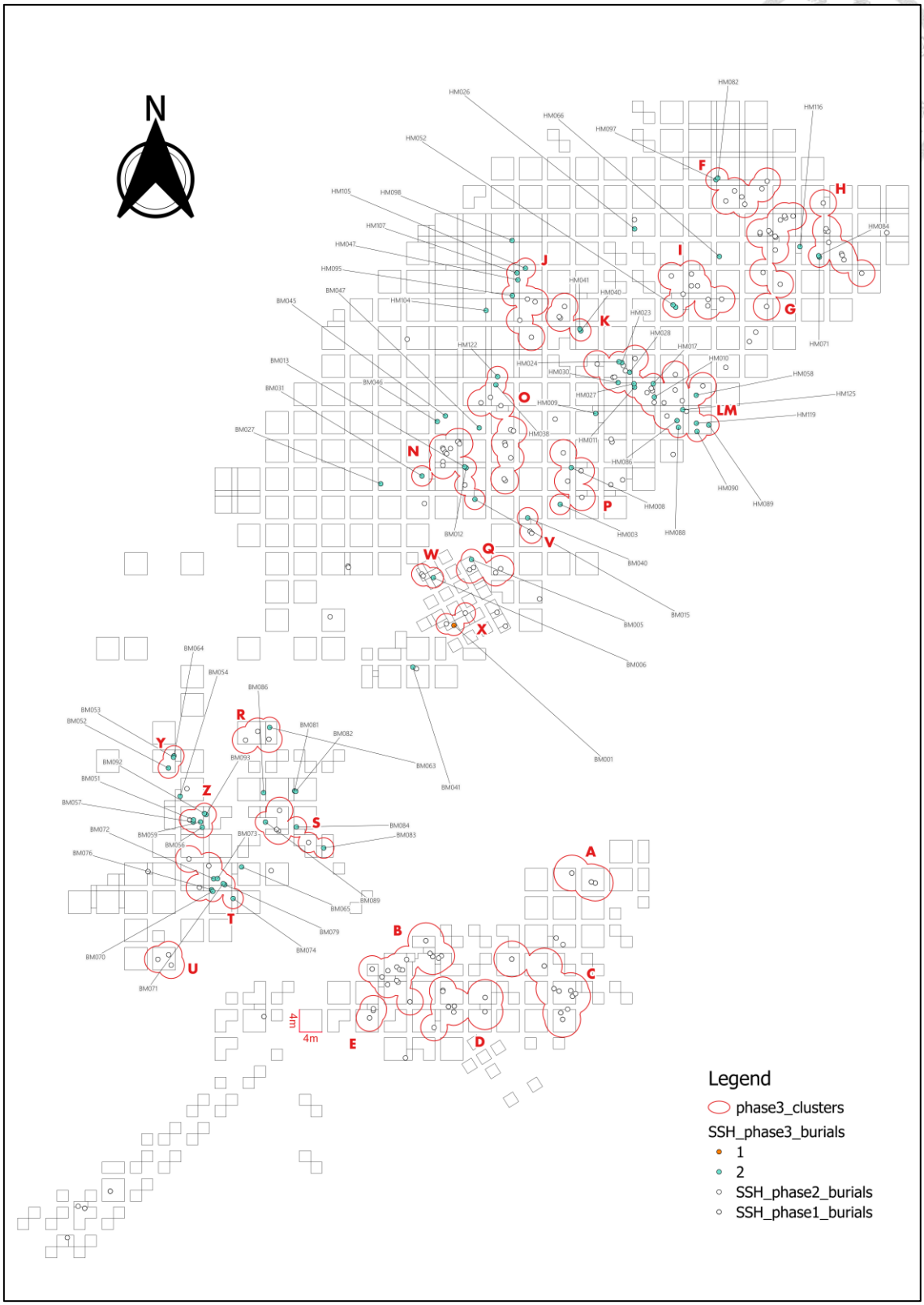

Figure 38. Map of the distribution of the graves belonging to different clusters (C1 (n=1) and C2 (n=74)) identified via cluster analysis in Phase 3, with the name of each grave labeled. Image created by the author.

doi:10.6342/NTU202502709

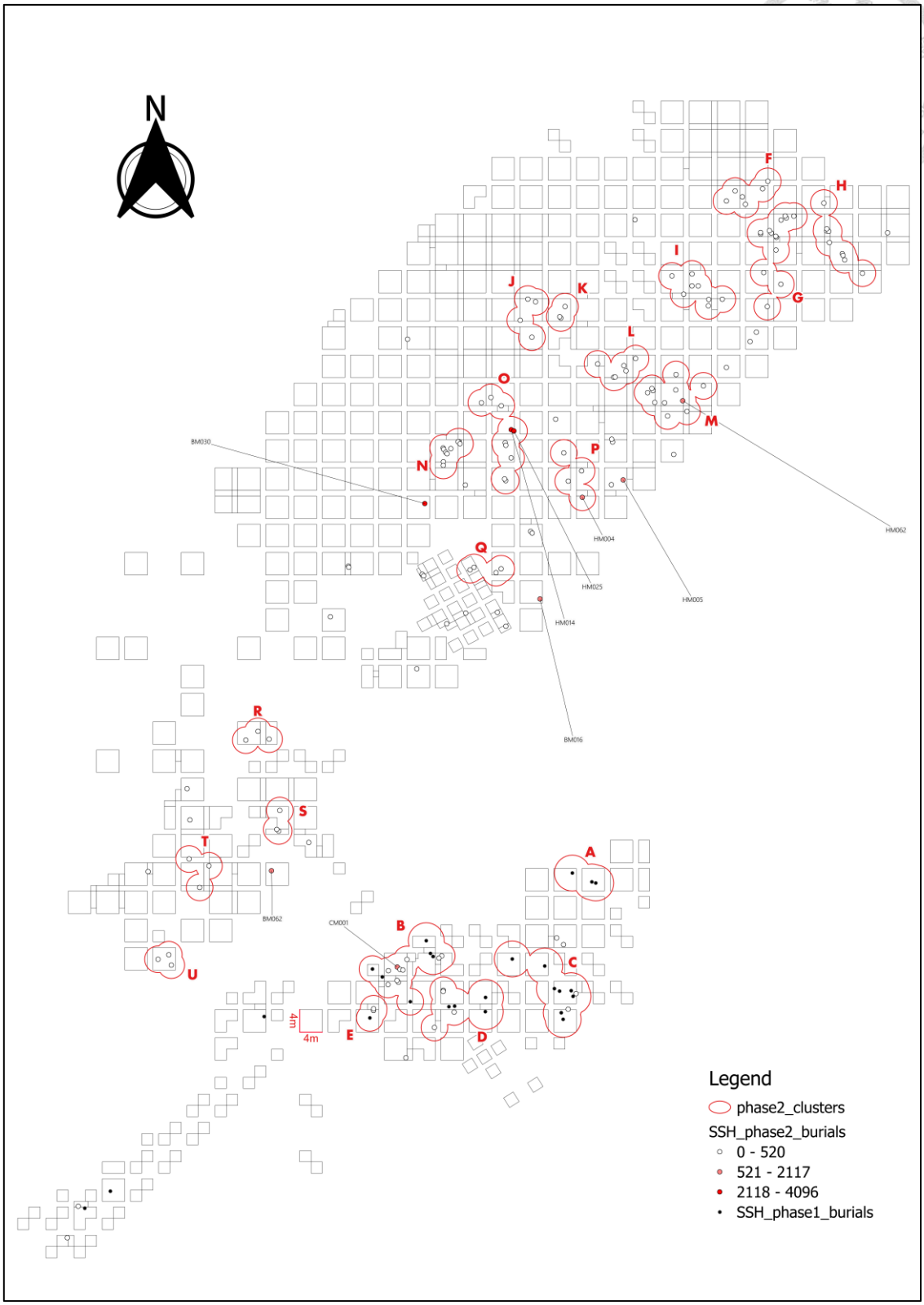

Figure 39. Map of the distribution of glass beads in Phase 2, with burials containing over 520 beads labeled. Image created by the author.

doi:10.6342/NTU202502709

TABLE CAPTIONS

Table 1. The C14 determinations used in this research, with "SCL" standing for the "Shihsanhang Culture Layer." The calibration of the Libby dates was performed by Professor Wang Kuan-Wen with Oxcal v4.4.4 (Bronk Ramsey 2021), r.5, and the IntCal20 calibration curve (Reimer et al. 2020).

Sample Code	Sector	Lab Code	Method	Source Feature Code	Opening Layer	Material	Libby Dates (B.P.)	Cal. Date (1δ)	Cal. Date (2δ)	Citation
SSH BM 75	B	GX-19460-G	AMS	BM75	bottom of the SCL	human bone	1455±175	1242-1536	1049-1709	臧振華、劉益昌 2001
SSH BM 60	B	GX-19459-G	AMS	BM60	bottom of the SCL	human bone	1380±90	1244-1368	1174-1415	臧振華、劉益昌 2001
SSH BM 13	**B**	**GX-19458-G**	**AMS**	**BM13**	**within the SCL**	**human bone**	**1390±135**	**1175-1411**	**1050-1541**	**臧振華、劉益昌 2001**
SSH-V-13	**B**	**NTU-03009**	**AMS**	**BM15**	**within the SCL**	**charcoal**	**860±50**	**717-794**	**680-832**	**臧振華、劉益昌 2001**
SSH-IV-1	**C**	**NTU-02096**	**AMS**	**CM62**	**within the SCL**	**charcoal**	**1070±50**	**927-997**	**904-1073**	**臧振華、劉益昌 2001**
SSH CM 28	**C**	**GX-16462-G**	**AMS**	**CM28**	**within the SCL**	**human bone**	**1820±155**	**1541-1890**	**1387-2103**	**臧振華、劉益昌 2001**
SSH CM 53	**C**	**GX-19464-G**	**AMS**	**CM53**	**within the SCL**	**human bone**	**1350±80**	**1242-1313**	**1174-1383**	**臧振華、劉益昌 2001**
SSH HM 20	H	GX-19465-G	AMS	HM20	bottom of the SCL	human bone	1325±125	1175-1346	957-1416	臧振華、劉益昌 2001
SSH-V-22	H	NTU-03016	AMS	HM59	bottom of the SCL	charcoal	1110±50	958-1059	926-1124	臧振華、劉益昌 2001
SSH-V-25	H	NTU-01716	AMS	PH19	bottom of the SCL	charcoal	1320±60	1260-1312	1175-1375	臧振華、劉益昌 2001
SSH-V-23	**H**	**NTU-03020**	**AMS**	**PH6**	**within the SCL**	**charcoal**	**560±35**	**597-624**	**587-644**	**臧振華、劉益昌 2001**

Table 2. The Average Nearest Neighbor (ANN) analytical results of the graves from each phase.

	Nearest Neighbor Ratio	Observed Mean Distance	Expected Mean Distance	p-value	pattern
Phase 1 *(N=25)*	0.659467	3.5757 m	5.4220 m	0.001125	clustered
Phase 2 *(N=156)*	0.478564	2.5715 m	5.3733 m	0	clustered
Phase 3 *(N=75)*	0.550726	2.0220 m	3.6715 m	0	clustered

doi:10.6342/NTU202502709

Table 3. The percentages and counts of within-cluster and outlier graves from each phase.

	Within-Cluster Graves	Outlier Graves	Total
Phase 1	80% (20)	20% (5)	100% (25)
Phase 2	78% (142)	22% (39)	100% (181)
Phase 3	82% (210)	18% (46)	100% (256)

Table 4. The Global Moran's I (GMI) analytical result of the skeletal sexual characteristics from each phase.

	Moran's Index	p-value	Pattern
Phase 1 *(N=25)*	0.090191	0.227911	random
Phase 2 *(N=156)*	0.032828	0.633404	random
Phase 3 *(N=75)*	-0.038077	0.804985	random

Table 5. The Global Moran's I (GMI) analytical result of the ages from each phase.

	Moran's Index	p-value	Pattern
Phase 1 *(N=25)*	-0.282556	0.269396	random
Phase 2 *(N=156)*	-0.034913	0.625751	random
Phase 3 *(N=75)*	-0.041134	0.422919	random

Table 6. Spearman's correlation and p-value matrices of each phase. (https://docs.google.com/spreadsheets/d/e/2PACX-1vSM77XzgTthiFKgF1MdFqMLJmagI59M_WihDbu8-phY1CaQarHguraSgCgxH7MHf5NW2lIFji9FhJjO/pubhtml)

Table 7. Characteristics of each cluster identified by cluster analysis (CA) from Phase 1.

Cluster	Characteristics
C1 *(n=3)*	Have relatively more beads (37≤x≤93)
C2 *(n=2)*	Have one pottery container; few bead counts (x≤4)
C3 *(n=20)*	Have few to no grave goods

Table 8. Characteristics of each cluster identified by cluster analysis (CA) from Phase 2.

Cluster	Characteristics
C1 *(n=56)*	Have at least one pottery container. Exception: HM117
C2 *(n=6)*	Each has a bronze knife handle.
C3 *(n=94)*	Without pottery container. Exception: CM004 and HM072

Table 9. Characteristics of each cluster identified by cluster analysis (CA) from Phase 3.

Cluster	Characteristics
C1 *(n=1)*	BM001 only. It has 58 limestone beads, one silver foil item, five lithic artifacts, and 131 carnelian beads.
C2 *(n=74)*	The rest of the Phase 3 burials. Most without pottery. Bead count x<200

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APPENDIX 1

A.1. The Codes for Calculating Spearman's Correlation Coefficients

#Step 1. Load the required libraries

```
library(readxl)
library(dplyr)
```

#Step 2: Load the dataset for analysis

```
data <- read_excel("file_name.xlsx")
```

#Step 3: Remove the names of each grave, as they are not part of the data to be analyzed

```
corr_data <- data[, -1]
```

#Step 4: Initialize matrices

```
n <- ncol(corr_data)
spearman_corr_matrix <- matrix(NA, n, n)
pval_matrix <- matrix(NA, n, n)
colnames(spearman_corr_matrix) <- colnames(corr_data)
rownames(spearman_corr_matrix) <- colnames(corr_data)
colnames(pval_matrix) <- colnames(corr_data)
rownames(pval_matrix) <- colnames(corr_data)
```

#Step 5: Compute Spearman's correlation matrix and p values

```
for (i in 1:n) {
  for (j in 1:n) {
    test <- cor.test(corr_data[[i]], corr_data[[j]],
                     method = "spearman", use = "pairwise.complete.obs")
    spearman_corr_matrix[i, j] <- test$estimate
    pval_matrix[i, j] <- test$p.value
  }
}
```

#Step 6: Create the data frames of the correlation and p-value matrices

```
corr_df <- as.data.frame(spearman_corr_matrix)
pval_df <- as.data.frame(pval_matrix)
```

#Step 7: Export the correlation and p-value matrices

```
install.packages("writexl")
library(writexl)
write_xlsx(corr_df , "file_name.xlsx")
write_xlsx(pval_df , "file_name.xlsx")
```


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A.2. The Codes for Cluster Analysis

```
#Step 1. Install and read the required libraries

install.packages(c("dplyr", "factoextra"))
library(readxl)
library(dplyr)
library(factoextra)

#Step 2. Read the dataset

data <- read_excel("file_name.xlsx")

#Step 4. Remove the name of each grave

cluster_data <- data[, -1]

#Step 3. Conduct the log+1 transformation

cluster_data$glass_bead <- log(cluster_data$glass_bead + 1)
cluster_data$car_bead <- log(cluster_data$car_bead + 1)

#Step 5. Calculate the mean distance with Gower's method

library(cluster)
gower_dist <- daisy(cluster_data, metric = "gower")

#Step 6. Employ Ward's method

hc <- hclust(gower_dist , method = "ward.D2")

#Step 6. Find the elbow point to determine the number of clusters

fviz_nbclust(cluster_data, FUN = hcut, method = "wss")

#Step 7. Draw the clustering dendrogram and set Y as the elbow point

plot(hc, labels = data$name, main = "Phase X Grave Goods Clustering Dendrogram",
cex = 0.4)
rect.hclust(hc, k = Y, border = "red")

#Step 8. Create a new column for the cluster codes

cluster_labels <- cutree(hc, k = Y)
data$cluster <- cluster_labels

#Step 9. Export the dataset with the cluster codes

install.packages("writexl")
library(writexl)
```


doi:10.6342/NTU202502709

```
write_xlsx(data, "output_filename.xlsx")
```

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