



The later prehistory of Southeast Asia and southern China: the impact of exchange, farming and metallurgy

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Abstract

This paper integrates the later prehistory of mainland Southeast Asia with that of the extensive and varied lands north to the Yangtze River and beyond. Five millennia ago, rice cultivation had long been established in the Yangtze catchment, sustaining the early state centered at Liangzhu. This presents a sharp contrast to the complex hunter-gatherer communities then occupying favorable coastal and riverine habitats in Southeast Asia. Thereafter, numerous contacts are identifiable. These involved the movement south of rice and millet farmers, via the coast and strategic river courses that led to integration with long-established hunter-gatherers, as well as the introduction of a wide range of material skills. The exchange of desirable prestige items in jade and shell spanned considerable distances. The reach of the powerful early states of the Central Plains of the Yellow River and Sichuan involved prospecting for copper and tin ores, and progressive adoption of copper-base technologies into Southeast Asia. Having reviewed these broad patterns of interaction, I focus on describing and evaluating the fine details of the social changes that are illuminated by new Bayesian chronologies and extensive excavations in key sites.

Keywords Rice domestication · Prestige exchange · Jade · Shell ornaments · Bronze technology · Social change

1 Introduction

The area often referred to as mainland Southeast Asia, which for this paper comprises the modern states of Vietnam, Laos, Thailand, and Myanmar, incorporates broad riverine plains often flanking the seashore, interspersed with upland ranges. The principal lowlands considered below incorporate the lower reaches of the Red and Dong Nai rivers in Vietnam, the inland Khorat Plateau, and the Central plain of Thailand drained by the Chao Phraya River (Fig. 1). This area experiences a monsoon climate, with heavy rains from May to November, followed by a long dry season. Proceeding north into Lingnan 岭南 and Yunnan 云南, there are matching plains drained by the Zhujiang 珠江 or Pearl River that are linked by a series of rivers with the Yangtze catchment. The Mekong, Salween, and Irrawaddy arise in the eastern Himalayas and bisect extensive uplands as they flow south, providing ready access between the early states of the Yellow and Yangtze

river plains and Southeast Asia. The Mekong, for example, was navigated upstream in 1641 by the Dutch merchant Geritt van Wusthoff in a matter of weeks, and more extensively to Kunming 昆明 by Doudart de Lagrée in 1866–7 (van Wusthoff 1993; de Carné 1872).

The purpose of this paper is to examine the structure of two seminal cultural changes that deeply influenced the later prehistory of Southeast and East Asia and underwrote the foundation of early states. The first is the impact of food production seen in the domestication of rice and millet, together with pigs, dogs, and cattle, relevant communities being referred to as Neolithic. The second is the spread and adoption of copper-base metallurgy. There is no doubting that communities practising agriculture were being established across the lowlands of Southeast Asia from the late third millennium BC. There has, however, been debate over the degree to which this occurred through indigenous innovations linked with demographic continuity, or the demic dispersal of new populations from the centers of domestication now documented in the Yangtze valley for rice, and the Yellow River region for millet. The inputs to this debate are not isolated to South and East Asia. We find virtually identical themes being pursued from the Levant to Britain that, likewise, involved the relationships between indigenous hunter-gatherers and putative groups of

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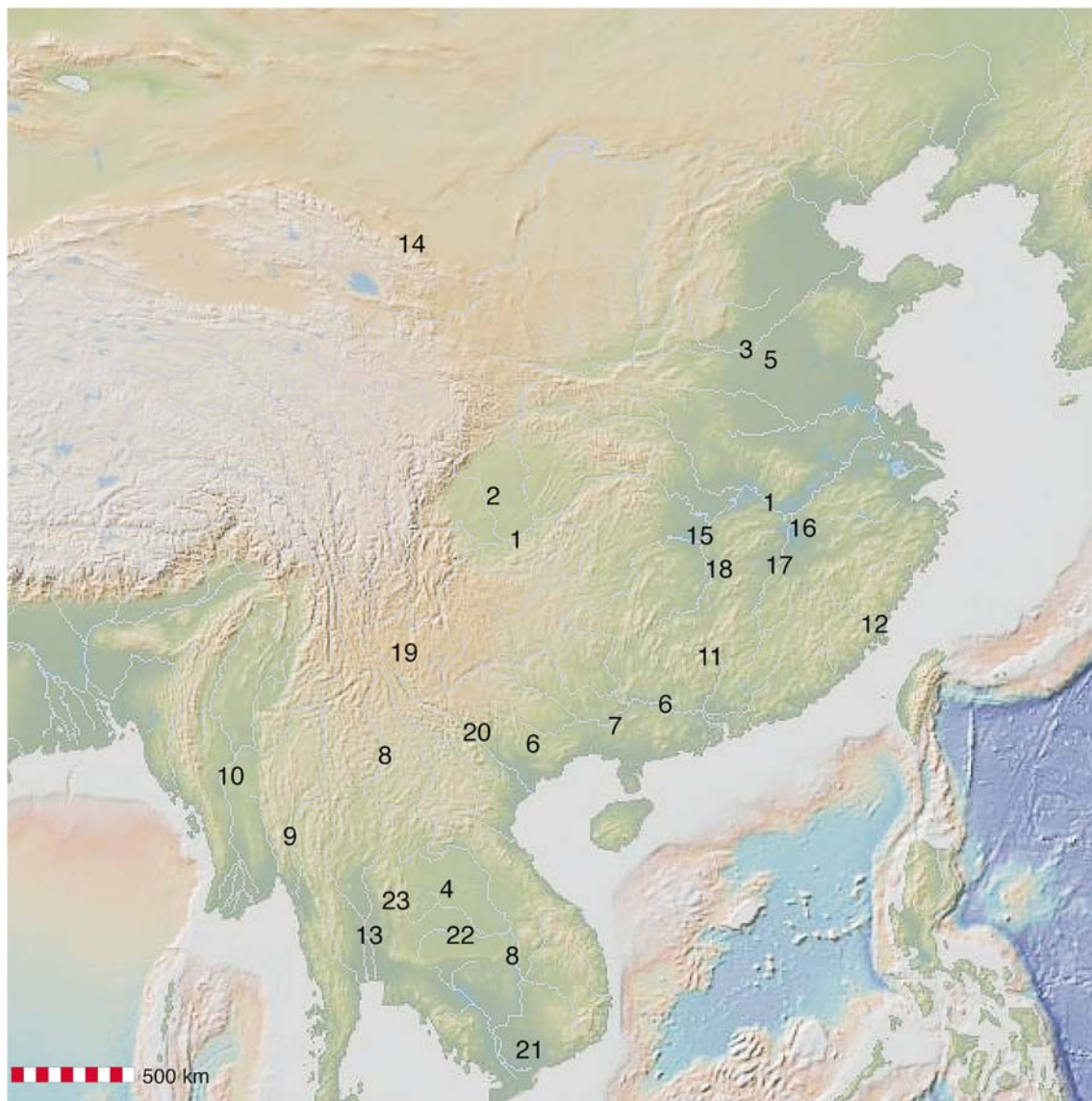


Fig. 1 Map showing the principal locations mentioned in the text. 1. Yangtze River; 2. Sichuan; 3. Yellow River; 4. Khorat Plateau; 5. The Central Plain; 6. Lingnan; 7. Zhujiang River; 8. Mekong River; 9. Salween River; 10. Irrawaddy River; 11. Bei River; 12. Fuzhou Basin; 13. Khao Wong Prachan Valley; 14. Gansu; 15. Lake Dongting; 16. Lake

Poyang; 17. Gan River; 18. Xiang River; 19. Lake Dian; 20. Red River; 21. Dong Nai River; 22. Mun River; 23. Petchabun Range. Figure by C.F.W. Higham made using GeoMapApp (www.geomapapp.org), CC by Ryan et al. (2009)

immigrant farmers. There, much light has been thrown on the alternatives by analysing ancient DNA. As Hofmanová et al. (2016) have shown, new groups of farmers expanded into temperate Europe from Anatolia and Greece with little admixture from resident hunter-gatherers. However, this relationship was more complex by the time farmers reached France by inland riverine and coastal routes, where there was a significant degree of admixture during the middle stages of the Neolithic (Rivollat et al. 2020).

We now have the first two corresponding results from aDNA in Southeast Asia. Although as yet nowhere near matching the depth of insight seen in Europe, both studies reach the same conclusion: there was a demographic

expansion of East Asian farmers into Southeast Asia, as seen in the sites of Man Bac and Ban Chiang, with a genetic ancestry distinct from that of the indigenous hunter-gatherers as seen, for example, at Gua Cha in Malaysia (Lipson et al. 2018; McColl et al. 2018). As in Europe, there is also the likelihood that there was significant interaction with the Australo-Melanesian indigenous hunter-gatherers, as has been documented as late as 300 BC- AD 200 at the inland Cambodian settlement of Phum Snay (Matsumura et al. 2011).

The information from aDNA is but one new insight into Southeast Asia, where the energy of prehistoric research has for too long been diverted by debates over chronology. Now that this issue has been resolved by multiple radiocarbon

determinations from key sites (Higham et al. 2015), one can turn to more interesting and productive topics, not least by enlisting models generated in other parts of the world under related or similar instances of cultural change. For example, Earle et al. (2015) have employed a political economy model in which to weigh the comprehensive information available for the European Bronze Age. Its essence is this. Copper and tin, together with other desirable materials such as salt, amber, and shell and high quality ceramics, have restricted distributions. Exchange in these goods is constrained by geography. Rivers, the coast, and passes through uplands involve constriction points the control of which give social advantages to strategically positioned communities. In the Carpathian Basin, it has been noted that sites were occupied over multiple generations, giving corporate groups the opportunity to own and maintain the local resources necessary to engage in reciprocal exchange, and gain wealth and prestige by ownership of exotic valuables that passed of necessity through the constriction points they controlled. This is a model that has not been adopted or applied with any rigor in Southeast Asia, but it is one that has the potential to illuminate and better understand the key changes in the three millennia reviewed below. Given the highly varied landscapes of Southeast Asia, it is considered highly likely that the expansion of farmers and spread of metallurgical knowledge will by no means be uniform.

In this approach, the location of a site relative to a potential constriction point is a central issue. Domestic houses are very rare in prehistoric Southeast Asia: excavated areas have very rarely been extensive enough to identify residential plans. This has led to a reliance on human burials as a source of social information, particularly the degree to which presumably prestigious items, or the sheer number of mortuary offerings, are in question. This information must also be considered with the plan of a burial ground. In some sites, graves were widely spaced with no clear patterning. In others, we find one corporate group, and in yet others, there were tightly defined and distinct clusters or rows. There is an extensive literature on the relationship between ancestral graves and the family or corporate ownership of resources, as seen in the Louisiade Archipelago (Battaglia 1983), making it imperative, having described the available information, to explore its social implications. We will also find that during the Neolithic shell jewellery, very often involving marine species such as tridacna, trochus, and conus, was one of the commonest of a set of widely-traded goods that ended in human burials. As part of the extensive literature on the social role played by such shell ornaments, Goto (1996) has described how in traditional Malaitan society, women spend hours a day making beads, arm rings, bracelets, necklaces, discs, head and chest bands that play a vital social role in bride price prestations, feasting ceremonies, gift exchange, and mortuary rituals. Ownership reflects wealth and social success, and access to the shell beds that furnish the raw materials is jealously guarded.

2 The origins and spread of early farmers

Identifying the origin and the spread of both people and objects through the analyses of isotopes and ancient DNA has revealed interconnectedness over considerable distances. We begin with Liangzhu 良渚 (Renfrew and Liu 2018; Fig. 2). Described as possibly the earliest state society in East Asia, this urban center and dependent settlements arose on the foundation of water control and intensive rice cultivation, and flourished for a millennium from ca. 3300 BC. The elite burials of Sidun 寺墩 and Fanshan 反山, in which the dead were interred in an extended supine position, include as mortuary offerings, jade *bi* 璧 discs and *cong* 琮 that required a high degree of expertise to manufacture. Ciarla et al. (2017) have cited five associated workshops that have yielded evidence for string sawing and the use of sand-tipped bamboo and sandstone drill bits. The lower Yangtze was one of the centers that generated a southward expansion of farmers in a process described in detail by Rispoli (2008). The site of Nanshan 南山 is a key to this expansion for here, thousands of rice and millet grains have been reported, dating between 3200 and 2500 BC (Yang et al. 2017; Fig. 3). Four radiocarbon dates from a rice grain and charcoal from Laoyuan 老院 provide a date of ca. 2500 BC for early rice farmers. Further south, this is evidenced with particular clarity at Shixia 石峡 and associated settlements in the valley of the Beijiang 北江 River (Shellach-Lavi 2015), as well as further south still at Gancaoling 甘草岭, where the *cong* and *bi* surely reflect Liangzhu stimulus. A comparison between the radiocarbon dates from late hunter-gatherer contexts at the site of Guye 古椰 and Neolithic Shixia indicates that the ingress of rice farmers at the latter took place between 3090 and 2730 BC (Yang et al. 2018).

The southward expansion of rice farmers very probably followed different routes at different times. At Man Bac just south of the Red River delta, the population represented in the cemetery falls into two distinct groups. One had the cranial morphology of indigenous Australo-Papuan hunter-gatherers, while the other was closely similar to the rice farmers of the lower Yangtze site of Weidun 圩墩 (Matsumura et al. 2017). The evidence from human aDNA also supports the model of an intrusive movement of rice farmers from the north that led to the Neolithic settlement of the margins of the lower course of the Red River from about 2000 BC, settlements ascribed to the Phung Nguyen culture after the name of the eponymous site. This has been supported by the analysis of pig DNA, that has identified a Chinese origin for Southeast Asian suids (Wannajuka et al. 2013).

While the aDNA and cranial morphology link this nodal region with the Yangtze heartland in terms of the initial expansion of rice farmers, there is much material evidence for shared technological expertise and exchange linkages over a remarkable wide area. Rispoli (2008) has explored

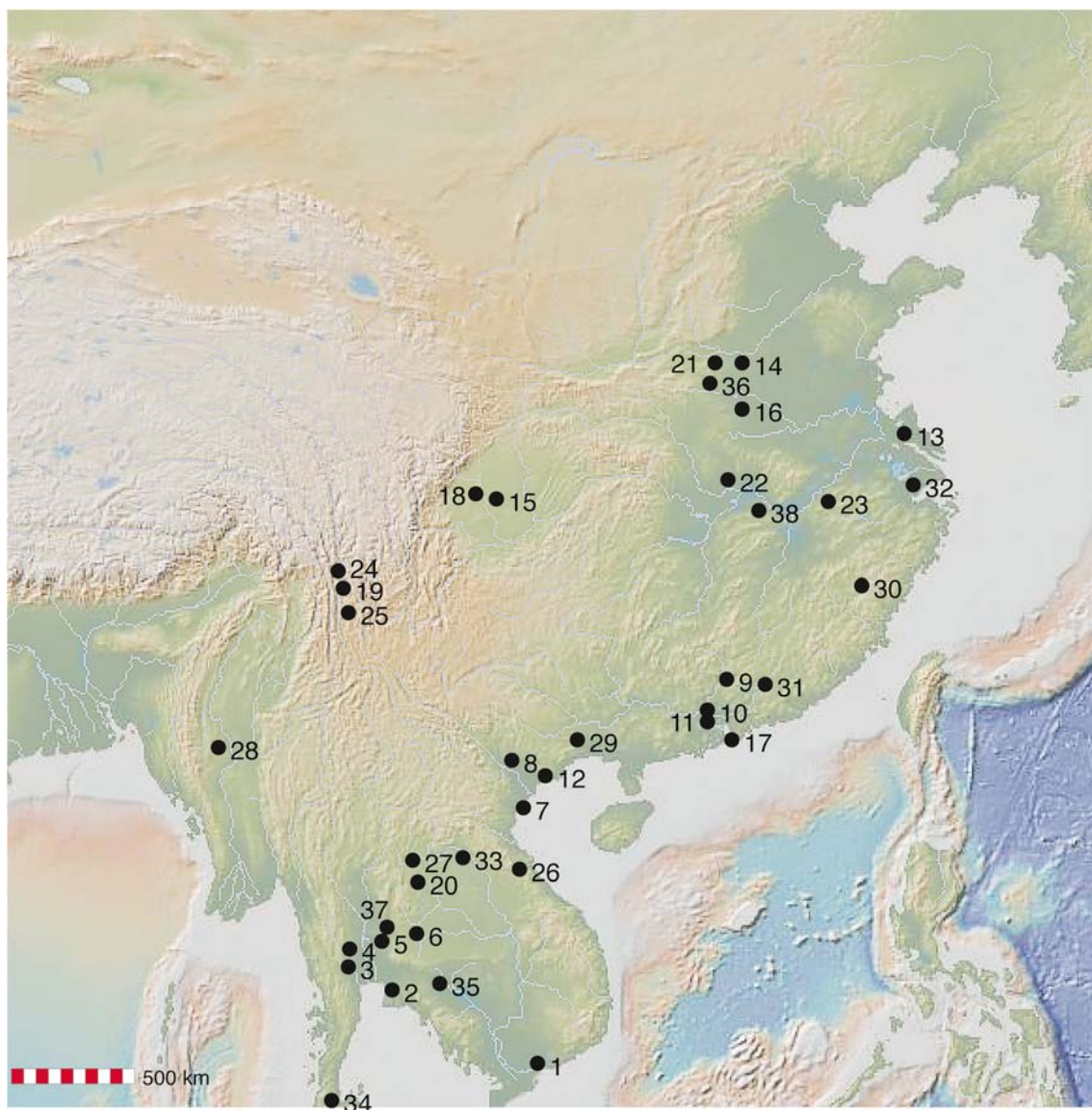


Fig. 2 Map showing the principal sites mentioned in the text. 1. An Son; 2. Khok Phanom Di; 3. Ban Kao; 4. Nong Ratchabat; 5. Non Pa Wai, Tha Kae; 6. Ban Non Wat, Ban Lum Khao; 7. Man Bac, Con Co Ngua; 8. Phung Nguyen, Xom Ren, Lung Hoa, Khu Duong; 9. Shixia; 10. Guye; 11. Gancaoling; 12. Trang Kenh; 13. Weidun; 14. Erlitou; 15. Sanxingdui; 16. Jiahu; 17. Sham Wan; 18. Baodun; 19. Baiyangcun; 20. Non Nok Tha; 21. Zhengzhou; 22. Panlongcheng; 23. Tongling;

24. Haimenkou; 25. Hebosuo, Shangxihe; 26. Vilabouly; 27. Phu Lon; 28. Oakaei; 29. Dingsishan; 30. Nanshan; 31. Laoyuan; 32. Liangzhu, Sidun, Fanshan; 33. Ban Chiang; 34. Gua Cha; 35. Phum Snay; 36. Peiligang; 37. Khok Charoen; 38. Tonglùshan. Figure by C.F.W. Higham made using GeoMapApp (www.geomapp.org), CC by Ryan et al. (2009)

similarities in how high-quality pottery vessels were decorated with incised and impressed designs. The late Phung Nguyen nephrite workshop at Trang Kenh produced rings, beads, and bracelets employing the manufacturing methods long established in Liangzhu workshops (Nguyen 1996). Spindle whorls evidence the production of the yarns that are the basis of weaving fabrics. Remarkably too, ceremonial *yazhang* 牙璋 blades that are such a central artifact in the state rituals at Erlitou 二里头 and Sanxingdui 三星堆, have been found in elite graves at Phung Nguyen and Lung Hoa (Fig. 4). The coast is one natural route for further expansion of rice farmers deeper

into mainland Southeast Asia. During the early centuries of the second millennium BC, we find new settlements along the coast of Vietnam, in the Dong Nai River catchment, and further west still, on the shore of the Gulf of Siam at Khok Phanom Di.

A second probable route taken by expanding farmers was first suggested by Sørensen (1972) following his excavations at Ban Kao in west Central Thailand. Here, the forms of pottery vessels and their surface decoration were regionally distinct, seen recently at the closely related site of Nong Ratchabat (Fig. 2). Moreover, the domestic plant remains

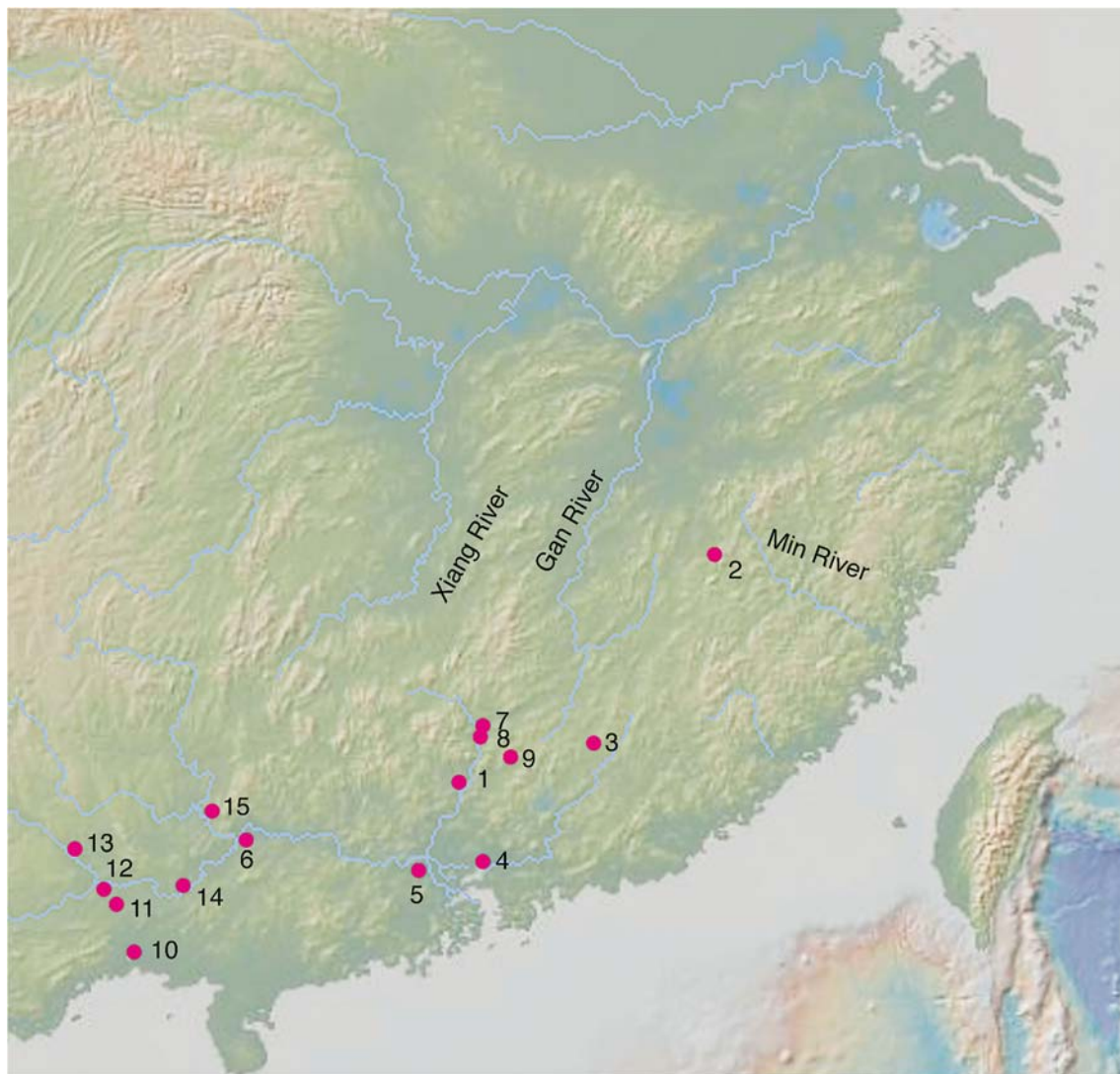


Fig. 3 Map showing the principal sites in Lingnan that document the southern expansion of Neolithic farmers. 1. Shixia; 2. Nanshan; 3. Laoyuan; 4. Chaling; 5. Guye; 6. Guangxinhe; 7. Niling; 8. Chuangbanyang; 9. Xiajiaolong; 10. Duliao; 11. Dingshishan; 12.

Baozitou; 13. Shijiaoshan; 14. Jiankou; 15. Nanshanwan. Figure by C.F.W. Higham made using GeoMapApp (www.geomapp.org), CC by Ryan et al. (2009)

from Non Pa Wai, again in Central Thailand, were dominated by millet rather than rice (D’Alpoim-Guedes et al. 2020). Movements southwards from Sichuan 四川 and Yunnan along the courses of the Salween and Chao Phraya rivers seem likely. A third route could well have taken advantage of the Mekong River, bringing farmers onto the Khorat Plateau of Northeast Thailand.

The Neolithic occupation of mainland Southeast Asia lasted for about a millennium, from ca. 2100 BC. It was, as we have seen in the Red River region, an active participant in an extensive interaction sphere that incorporated large tracts of China, perhaps most persuasively seen in the distribution of cowrie shells that must have linked the known habitat of *Cypraea moneta* with the Yellow River and beyond. Starting among the farmers of the Central Plains, and rising

in frequency with the Shang 商 Dynasty, the flow of cowries north from the Indian Ocean reflects the transport of goods and doubtless, ideas (Fig. 5). The rice and millet farmers shared with their northern contemporaries developed and sophisticated techniques for the manufacture of ceramics, shell and stone ornaments and weaving technology. Some Chinese Neolithic sites, such as Jiahu 贾湖 in Henan Province, have been so extensively opened by excavation that substantial domestic and mortuary data are available (Zhang and Qilong 2013). This is facilitated by the relatively shallow stratigraphy. By contrast, most Southeast Asian Neolithic sites were part of a deep accumulation of cultural deposits that present a long sequence but no plans of domestic structures or extensive cemeteries. This militates against assessing the social lives of the prehistoric communities in question.

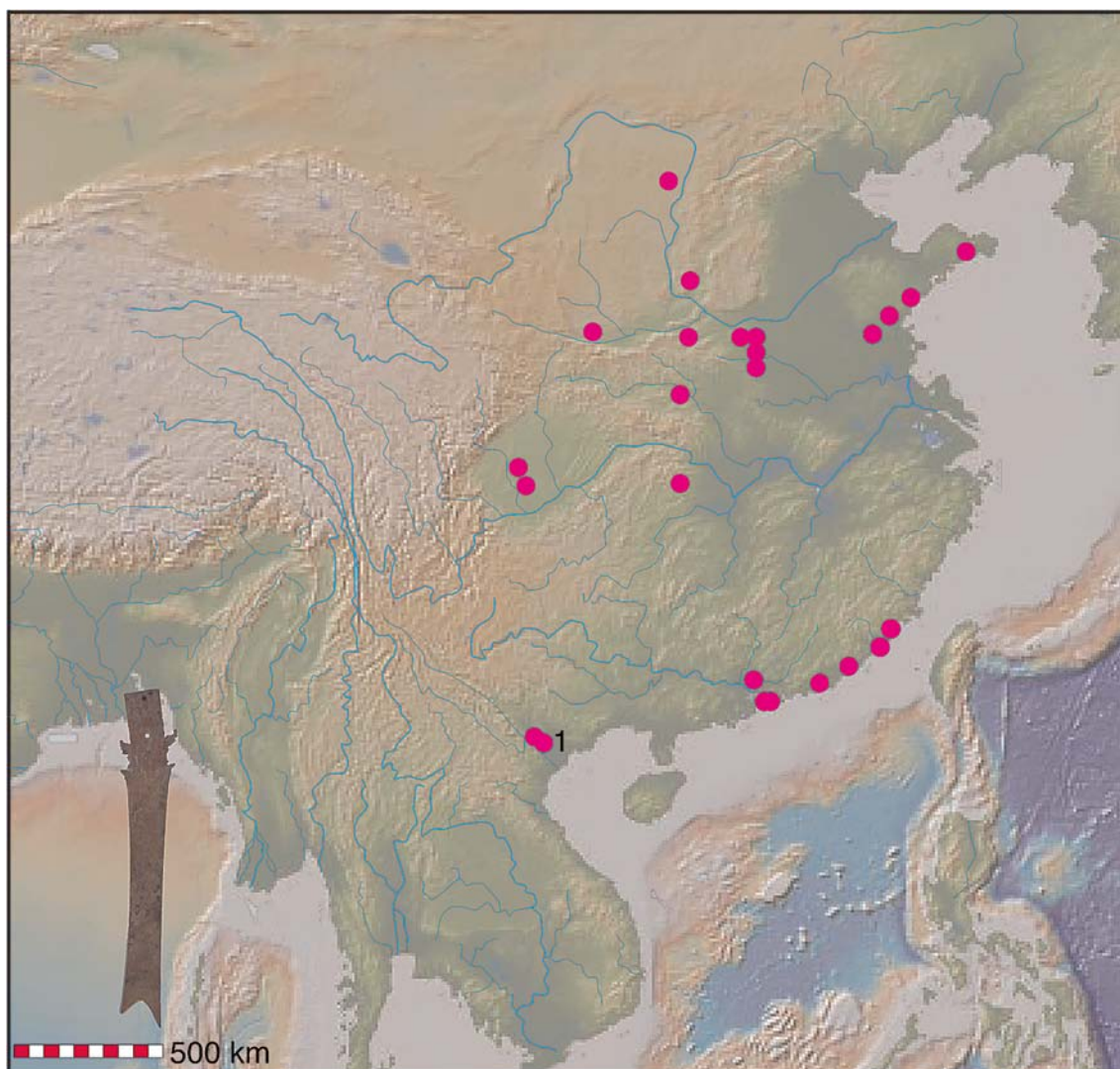


Fig. 4 The distribution of *yazhang* blades in Southeast and East Asia. 1. The Neolithic sites of Phung Nguyen and Lung Hoa. Figure by C.F.W. Higham made using GeoMapApp (www.geomapp.org), CC by Ryan et al. (2009)

3 Neolithic social change

Research on the Neolithic settlement of Southeast Asia has largely concentrated on chronology and origins. The way in which social relationships within and between sites evolved over a thousand years has received little attention. This is largely due to the lack of data. Settlements are not excavated on a sufficient scale to provide reliable evidence. In the absence of domestic houses, the available evidence comes from mortuary data and site locations.

3.1 Man Bac

Man Bac is located in the lower Red River region, one with direct access from the north either by the river or the coast (Oxenham et al. 2011). The radiocarbon chronology indicates that it was settled from about 2000 BC, making it an early site

in the Phung Nguyen culture sequence. During the occupation span, it was situated close to a mangrove-fringed shore giving access to rich fishing grounds. It is one of many settlements belonging to the Phung Nguyen culture, characterised by distinctive incised and impressed pottery vessels, fully developed expertise in the manufacture of stone and shell ornaments and tools, and clear evidence for contacts with the emerging early states of the Yangtze and Yellow river regions to the north. Human mitochondrial DNA has shown that some of those interred in the cemetery match that for the indigenous hunter-gatherers, while others present similarities with the Neolithic farmers of the Yangtze river region (Shinoda 2011) who introduced domestic pigs and the cultivation of rice, according to the abundance of rice phytoliths identified in the occupation contexts. Over several seasons, 85 burials have been excavated, most found concentrated in the basal layer (Fig. 6).

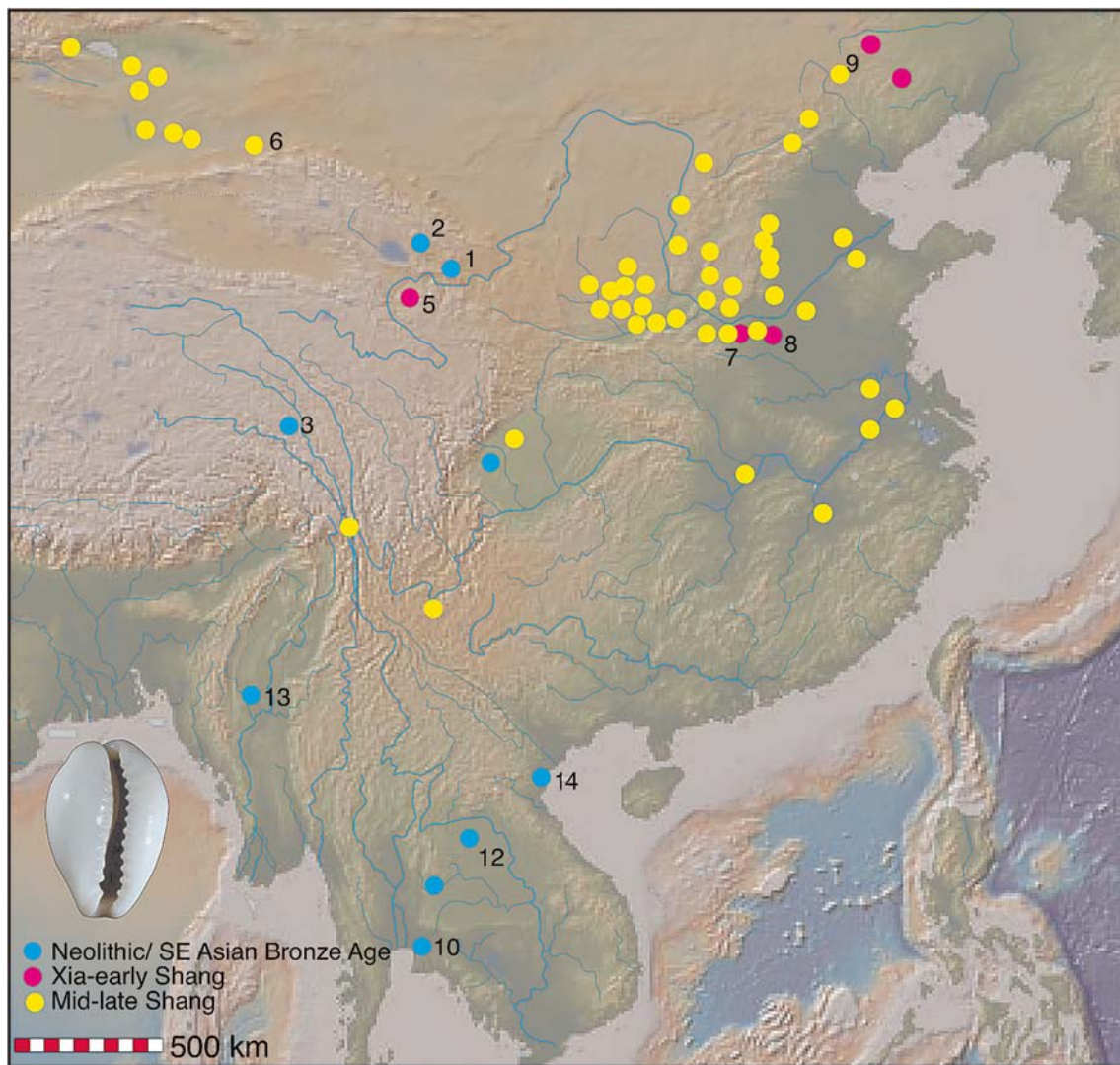


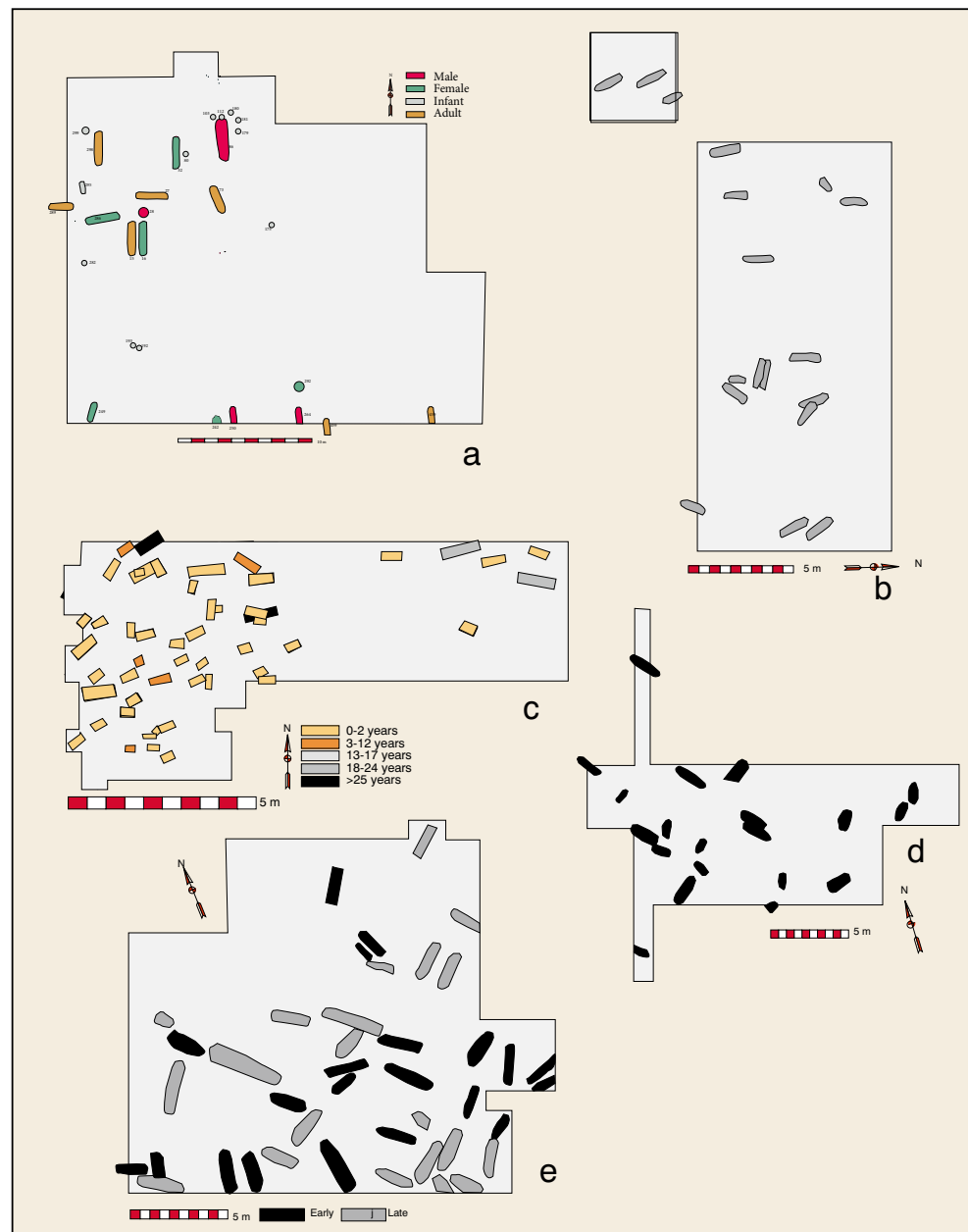
Fig. 5 The distribution of cowrie shells in Neolithic and early Historic Southeast and East Asia. 1. Ledu; 2. Datong; 3. Changdu; 4. Lijian; 5. Guinan; 6. Yumen; 7. Yanshi; 8. Yingyang; 9. Auhan; 10. Khok Phanom

Di; 11. Ban Non Wat; 12. Ban Na Di; 13. Oakeai; 14. Man Bac. Figure by C.F.W. Higham made using GeoMapApp (www.geomapapp.org), CC by Ryan et al. (2009)

The mortuary rituals practiced at Man Bac conform in general with other Neolithic settlements in Southeast Asia. Nearly all burials opened were interred in a supine position, contrasting with the preference for flexed burials seen in the preceding hunter-gatherer sites like Con Co Ngua (Oxenham et al. 2018), although a male in the 1999 season was flexed. It is stressed that the preference for an extended, supine position is widespread throughout Neolithic China, seen at Peiligang 裴李岗, Jiahu, Baiyangcun 白羊村, and indeed virtually all other relevant sites (YPM 1981; Liu 2004; Zhang and Qilong 2013). The dead were accompanied by offerings dominated by pottery vessels and ornaments. Some were interred with cowrie shells or holding bivalve shells. The latter recur in many Southeast Asian mortuary contexts and are thought, like the cowries, to represent fertility and notions of

rebirth. A feature of the Man Bac cemetery is the modest number of artifacts found in these graves. From infants and children to adults, few were buried with more than one or two pots, some clearly having been used for cooking to judge from the ash still adhering to them. However, a handful of individuals were richer, in terms of the items placed with them. A man aged about 25 was accompanied by eight pottery vessels, two clusters of cowrie shells, a nephrite bracelet, and bivalve shell. Another man in his thirties also wore a nephrite bracelet as well as tubular and disc-shaped nephrite beads. There were also two cowries and five pottery vessels. Both the manufacture of nephrite jewellery and the form of the pottery vessels point to a northern origin, Dung et al. (2011) finding parallels at the site of Sham Wan 深灣, Hong Kong, dating in the third millennium BC.

Fig. 6 The plan of Neolithic burial grounds. **a** Ban Non Wat, **b** Khok Charoen, **c** Man Bac, **d** Non Nok Tha, **e** Ban Kao



3.2 An Son

An Son is one of several Neolithic settlements in the valley of the Vam Co Dong River in southern Vietnam. This 5-m-high mound was occupied from ca. 2200–1500 BC, and stratigraphically it comprises superimposed clay floors that cover a cemetery dating to the early phase of occupation. Rice was cultivated from initial settlement, and the first settlers also brought domestic pigs and dogs. Access to marine resources was also possible as the river was tidal and fringed with mangroves and nypa palms. Bone fishhooks were in use and in the absence of local stone resources, adzes were fashioned from imported material. Pottery was locally

manufactured and shaped with clay anvils. Some vessels were burnished with a smooth stone, and decorated with the incised and impressed designs so characteristic of early farmers in Southeast Asia.

The mortuary rituals at An Son are typical of the early farming communities of Southeast Asia, the dead being interred supine and extended in individual graves. Offerings were dominated by pottery vessels, stone adzes, and shell beads. No individual stood out as being unusually wealthy, indeed several of the younger individuals had no grave goods. One adult male was accompanied by eight pots, an adze, and about 1000 shell beads. A young person aged between 10 and 14 years at death had three pots, an adze, and 13 shell beads,

while a woman with a burnishing stone, and therefore presumably a potter, had nine pots (Bellwood et al. 2013; Sarjeant 2017).

3.3 Khok Phanom Di

Khok Phanom Di is a Neolithic settlement covering ca. 5 ha, that was located in a strategic estuarine site at the mouth of the Bang Pakong River (Higham and Thosarat 2004a; Fig. 2). Occupied between ca. 2000–1500 BC, it is a key prehistoric site for assessing how a Neolithic community adapted to a coastal environment prone to unpredictable change as the level of the sea fluctuated. As Matsumura et al. (2017) have demonstrated on the basis of cranial morphology, the inhabitants of this site were closely related to ancestral populations of the lower Yangtze at the site of Weidun. For most of the occupation span, the mangrove habitat was not conducive to the cultivation of rice due to soil salinity. Fish and shellfish were important components of the diet, and as shell middens formed, the cultural deposits accumulated so rapidly that the mortuary remains present a virtually unique pattern of being set out in discrete superimposed clusters (Fig. 7). This has made it possible to trace about 17–20 generations over the course of the prehistoric occupation, and integrate evidence for social and environmental change.

Khok Phanom Di was ideally situated to participate in and control coastal and riverine communication routes. High-quality potting clay deposits lay at its doorstep. The first Neolithic settlers brought with them the ancestral technical skills documented in the ultimate Yangtze homeland. The isotopes in the teeth have shown that the adults in the earliest burials came to the site from a different environment, and caches at the very base of the site contained their adzes, burnishing stones, and anvils. They came equipped with the expertise to manufacture shell ornaments, and while no spindle whorls have been identified to suggest that weaving was undertaken, the presence of ceramic vessels impressed with cord marking attests to the production of yarn.

The first human graves were cut into an accumulation of shell middens and the ash that resulted from firing pottery vessels, and they were poorly endowed with mortuary offerings. One man wore 14 shell disc beads, and there were no pottery vessels. However, with the second phase of burials an enduring pattern was established in which the dead were interred in clusters set out on a regular, chequerboard pattern that continued for about 10 generations. Genetically inherited abnormal cranial bones suggest that the members of these clusters were related (Tayles 1999). The mortuary ritual involved extended inhumation in individual graves, a practice widespread in Southeast Asian Neolithic sites and in contrast to the flexed position habitually found among the preceding and indigenous hunter-gatherer communities of Southeast Asia and southern China. Red ochre was applied to the corpse

that was interred with a range of offerings dominated by personal jewellery and pottery vessels.

3.4 Khok Phanom Di mortuary phase 2

During most of these ca. two centuries from ca. 2000–1800 BC, Khok Phanom Di was located on or near an estuary. The tooth wear of men and women differed, which suggests that the former spent time away from the settlement, perhaps on trading voyages, while the women, to judge from mortuary offerings, were specialist potters. Burial 110 in cluster A, for example, an adult woman, was interred with a pottery vessel and five stones that had been used to burnish pots prior to firing, while the man in this cluster wore a necklace comprising 220 shell disc beads (Fig. 8). The contemporary cluster B reveals a similar pattern: a woman was accompanied by a burnishing stone and wore 55 shell beads strung as a necklace. Two men also wore shell bead necklaces, while an infant was buried with a bangle made from a large fish vertebra. Cluster D presents an unusual conjunction, a young male with just eight shell beads next to an infant buried with 45 such beads, 17 cowrie shells, seven fish-vertebra bangles, and six bone beads. Cluster E during this second mortuary phase was located at the edge of the excavated area and is probably incomplete. A man and a woman were interred next to each other. The man stood out on the basis of necklaces made from about 39,000 shell disc beads and 16 larger shell beads shaped like a barrel and a funnel. He was also interred with two burnishing stones. The female wore a necklace made from 16 teeth from muntjac deer. Members of cluster F were consistently wealthy in terms of the number of shell disc and barrel-shaped beads and pottery vessels. This includes infants, one of whom died aged about 4 months, who wore over 1133 shell beads and was accompanied by two pottery vessels. Burial 91, an older man, was found with four pots, two burnishing stones and 1376 shell beads strung as a necklace (Fig. 9).

It is concluded that the Neolithic population of Khok Phanom Di during this early period of settlement had established expertise in the manufacture of high-quality pottery vessels often embellished, as is typical of the initial farmer settlement of Southeast Asia, with complex incised and impressed designs. One family cluster was rather wealthier in terms of shell jewellery than the others, but some individuals in other clusters were also interred with more than typical wealth, particularly one man, burial 132, wearing about 39,000 shell beads.

3.5 Khok Phanom Di mortuary phase 3

Cluster A was represented by an adult female with no mortuary offerings, a male with 23 shell beads, two pots and for the first time, an ornament made from turtle shell. There were ten neonates, one of which wore

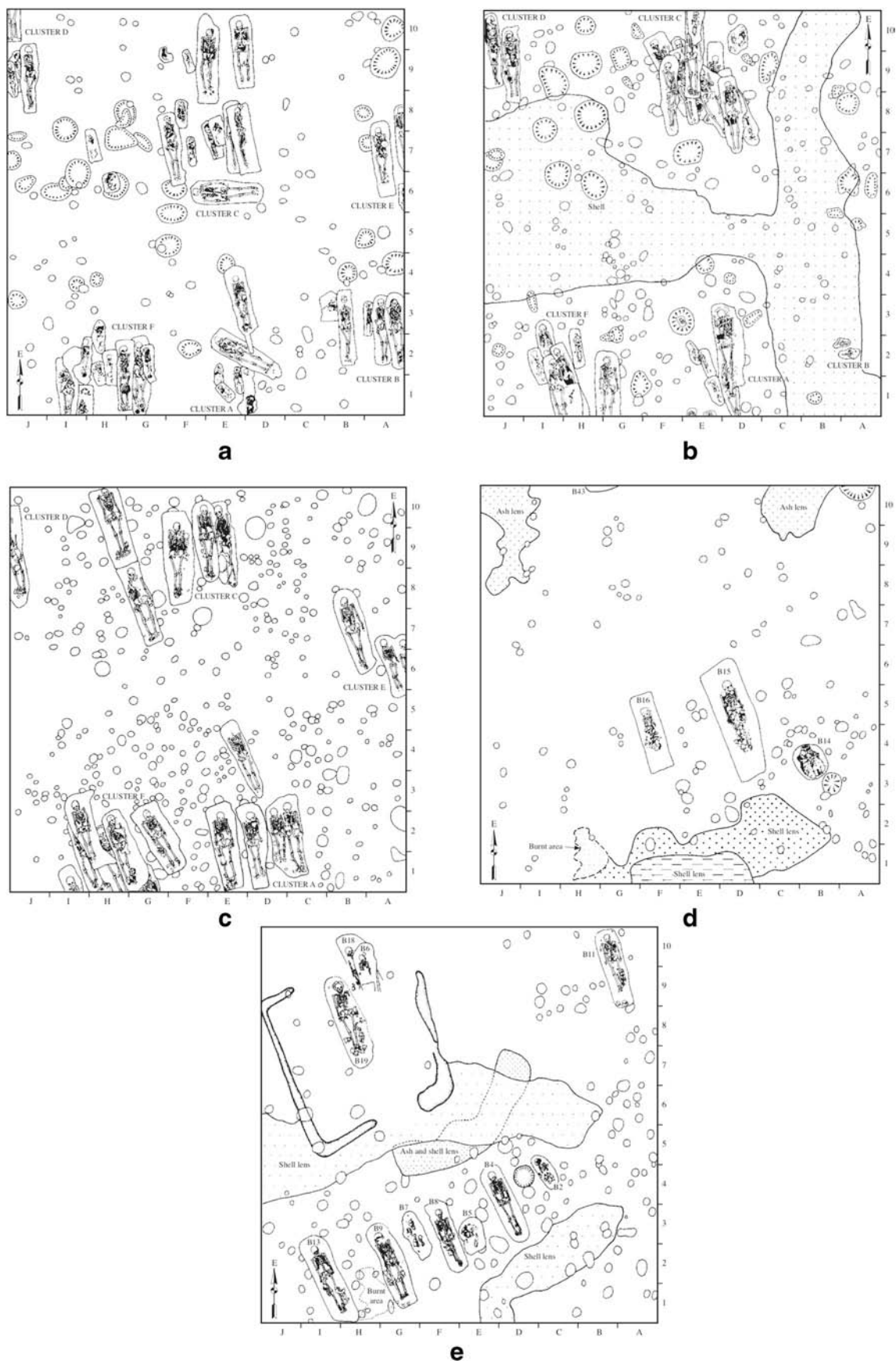


Fig. 7 The layout of the burials from Khok Phanom Di mortuary phases 2–6. **a** phase 2; **b** phase 3; **c** phase 4; **d** phase 5; **e** phase 6

a shell bead belt, the others being devoid of offerings save for some with a covering of red ochre. Cluster C contained a dense group of superimposed graves. The earliest set comprised two men, a woman, and a neonate, the adults being moderately wealthy with 1537, 859 and 1545 shell beads respectively, and either two or three pottery vessels. Slightly later, burial 72, a male, stands out for its variety of mortuary offerings, that included 331 beads, three pots, three burnishing stones, a deep-sea nautilus shell, and a pendant made from the dorsal spine of a shark. During the later burials in this cluster, wealth fell away. A male and female were accompanied by just two pots each and two other females with just one pot apiece. Two men represent cluster D. Both were modestly endowed with grave goods, one having 115 beads in a necklace and two pots, the other just two pots. After being relatively wealthy during the preceding phase, cluster F individuals now lacked any shell beads, and were accompanied only by one to three pottery vessels.

There was strong continuity between mortuary phases 2 and 3. Some individuals stood out on the basis of the weight of shell ornaments, including a closely linked set in cluster C. The inference drawn from these burials is that there was no social hierarchy but rather a reflection of transient personal achievement measured in the possession of exotic shell ornaments.



Fig. 8 The mortuary phase 2 cluster A burials at Khok Phanom Di. Burial 110 is in the center, between two infants and a male burial 100



Fig. 9 Khok Phanom Di mortuary phase 2 cluster F was consistently wealthy in terms of the number of shell disc and barrel-shaped beads and pottery vessels. This includes an infant who wore over 1133 shell beads and was accompanied by two pottery vessels. Burial 91, an older man seen to the left, was found with four pots, two burnishing stones, and 1376 shell beads strung as a necklace

3.6 Khok Phanom Di mortuary phase 4

The latter part of mortuary phase 3 witnessed a lowering of the sea level, the formation of freshwater conditions and the undoubted local cultivation of rice. This continued during mortuary phase 4, a period when men no longer exhibited strong upper body musculature typical of those engaged in coastal or sea voyaging. Mortuary phase burials continued in clusters A, C, D, E and F, involving eight males, eight females and six infants or children. There is considerable uniformity in the mortuary rituals for all five clusters in terms of orientation, the provision of red ochre on the body of the deceased, and the modest level of grave goods. Men were now interred with large turtle carapace ornaments that were broken before being placed in the grave. Pottery manufacture continued, a woman and one 12-year-old being interred with a clay anvil and burnishing stones, and similar stones being found with three

males. The number of shell disc beads fell dramatically, just 330 being worn by a man, 41 with an infant and eight with a woman.

3.7 Khok Phanom Di mortuary phase 5

The brief interlude of lower sea level ended with mortuary phase 5. The granite hoes and shell harvesting knives that were deployed when rice cultivation was possible in the area disappeared. The dead were no long interred in superimposed clusters, being replaced by four exceptionally wealthy burials. Two of these, burial 15, an adult female and a 15-month-old infant, burial 14, were buried in graves far larger than was necessary to contain the body each lying adjacent to areas of ash that were probably the remains of mortuary activity, such as feasting as part of the rituals of interment (Fig. 10). Both were intimately associated with the manufacture of pottery vessels, being covered in clay cylinders seen as preforms for the shaping of pots. A large bivalve shell had been placed beside the right ankle containing two burnishing stones, both heavily worked, and beside a clay anvil with an incised possible ownership mark. A miniature anvil and a burnishing stone lay beside the infant's right ankle. This probable mother and daughter also stood out for their weight of shell jewellery. The former wore clothing embroidered with 120,787 disc and 950 large I-shaped shell beads. The infant had 12,247 of the former variety and 200 of the latter (Fig. 11). The woman also wore a shell bangle, two large horned shell discs on her chest, and shell discs on her head. A similar shell bangle had been placed over the left wrist of the infant. Between eight and ten pots were associated with the adult and four with the infant.

A second infant lay on the other side of the adult grave. Also about 15 months of age at death, it was contained within two pottery vessels of outstanding quality, with two further pots within, and a shell belt comprising 269 beads (Fig. 12). Two male graves also belong to this phase. One of these was cramped within a very narrow grave on the northern edge of the burial of the wealthy female. Headless, it was associated with just two pottery vessels. The second was positioned in a direct line 4 m east of burial 15. Like the males of mortuary phase 4, the grave contained a turtle carapace ornament, and similarly to burial 15, it was extraordinarily wealthy in terms of shell ornaments: 56,200 disc beads, 435 I-shaped beads, a shell bangle, and two shell discs one of which was unfinished, since the groove cut into it would have furnished a bangle had it been completed. This would be the only evidence we have for local manufacture of shell ornaments unless this disc was imported in an unfinished condition. Burial 33, that of a three-year old, was located about 3 m north of burial 14 and might belong to this grouping. Again it was very wealthy in terms of shell ornaments, wearing 7845 disc and 107 I-beads. There were four fine pottery vessels and a clay anvil had been placed by the ankles (Fig. 13).

3.8 Khok Phanom Di mortuary phase 6

There was another change in mortuary practices with mortuary phase 6 to a background of continuing similarity in the basic ritual of interment in a supine position with the same range of mortuary offerings. Two females and a child were interred within a raised building with clay wall foundations and a clay floor (Fig. 14). The women were potters accompanied by their anvils, one with two burnishing stones. The child also had a burnishing stone. While not as outstandingly wealthy as during the preceding phase, the women wore respectively 9969 and 1600 shell disc beads, and the former also had 700 beads of a new H form. The child, aged about 9 years old, was only partially present following disturbance of the grave but still wore a necklace of 17,786 disc and 656 H beads, and a shell disc lay beside the head.

Eight graves lay directly in front of the mortuary structure and on the same orientation (Fig. 15). This group was located within a structure represented by postholes. There are two males, two females, twin neonates in the same grave, and two infants aged about nine and 21 months respectively. Both women were potters, equipped with an anvil and burnishing stones, one having eight. However, the individuals in question are uniformly poor, with just nine shell disc beads between them. The males still were accompanied by turtle carapace ornaments.

Khok Phanom Di was located in a classic nodal constriction point for exchange: an estuary. It had access to high quality potting clay and was a ceramic manufacturing center in which women made the pottery vessels. The dead were buried in tightly defined clusters, some of whom were interred with a considerable weight of shell ornaments and fine pottery vessels.

4 Inland sites

4.1 Khok Charoen

Very few Neolithic sites located in the interior of Southeast Asia have been published in sufficient detail for social organization to be assessed. Among the first to be excavated was Khok Charoen, located in the valley of the Pa Sak River 220 km north of Khok Phanom Di. This is a particularly important site because it is also a site with only Neolithic occupation, dated within the second millennium BC (Loofs-Wissowa 2017). This settlement lies between two streams, and covers ca. 4 ha. Excavations between 1967 and 1970 opened three different areas within it, all of which encountered human burials. The total number of 66 graves is one of the largest Neolithic samples in Southeast Asia. The occupants of Khok Charoen cultivated rice and millet, and were participants in an exchange network that involved marine shell,

Fig. 10 Khok Phanom Di burial 15. **a** the grave cut through an accumulation of white ash. **b** The skeleton covered with a mound of clay preforms for shaping pots, and several pottery vessels. **c** the upper body showing the shell discs. **d** a close up of the 120,000 shell beads



including cowries. Pottery vessels were ornamented with incised and impressed designs that find parallels across Southeast Asia, including Khok Phanom Di and Ban Non Wat.

There are three mortuary phases (Loofs-Wissowa 2017). The earliest is represented by 10 burials in an excavated area of 207 m², the graves widely dispersed with no evidence for clustering. The mortuary offerings were largely confined to up to 11 pottery vessels and some shell disc beads, one burial having 24, another 56 worn as bracelets, and a third 102.

One adult wore beads on the skull and a broken stone bangle on the right wrist. The second phase comprises 19 widely spaced burials in an area of 171 m² (Fig. 6b). Again, pottery vessels and shell disc beads dominated the grave goods. Burial 15, an adult man, wore 349 beads strung as necklaces, and had a stone adze. A conus shell disc similar to those found with burial 15 at Khok Phanom Di was recovered from burial 10a. A child was interred with two ivory bracelets. An area of 434 m² on the western edge of the site contained 37 graves representing the third mortuary phase. The dead were interred



Fig. 11 Khok Phanom Di burial 16, an infant interred covered in red ochre and with outstanding wealth that includes over 12,000 shell beads, a shell bangle, and a miniature anvil for shaping pottery vessels



Fig. 13 Burial 33 of Khok Phanom Di mortuary phase 5 was a very wealthy infant buried with about 8000 shell beads and a clay anvil

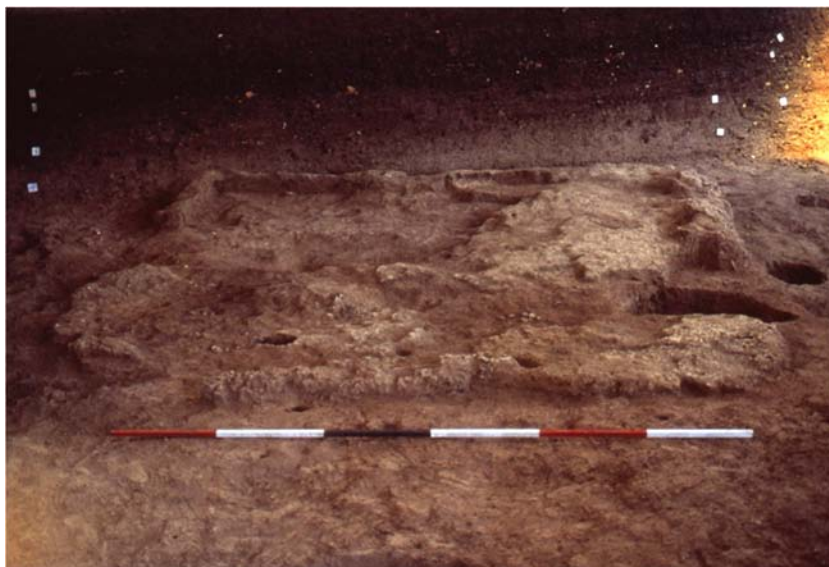
with pottery vessels, 19 being associated with one concentration of bones from three individuals, 12 with one adult. The

number of exotic shell and stone ornaments increased during this phase, with burial 24 having ten trochus shell and nine

Fig. 12 Burial 14 from Khok Phanom Di, an infant buried next to the very wealthy woman in burial 15, within two superb ceramic mortuary vessels



Fig. 14 This clay walled building at Neolithic Khok Phanom Di was raised on a platform, and two wealthy female graves were cut through the floor



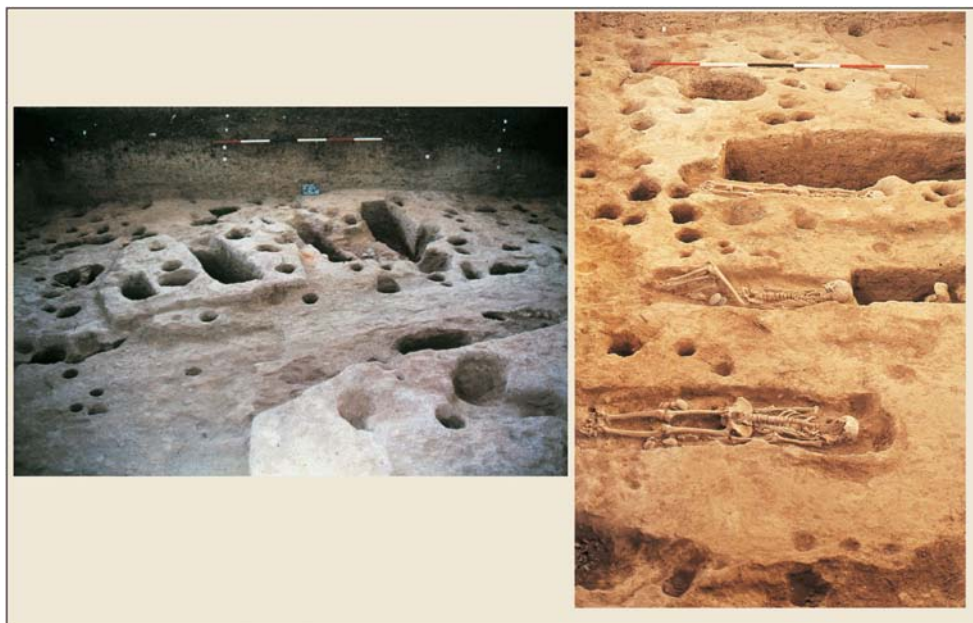
stone bangles, 843 shell disc and 12 stone beads. As at Khok Phanom Di, shell discs made from marine conus shells were found with the skull of burial 19. Burial 16 wore ten trochus shell bangles and 235 disc beads, with nine pottery vessels as well.

No information is available for domestic plants at Khok Charoen, but the Neolithic settlement of Non Pa Wai in the Khao Wong Prachan Valley (KWPV), just 80 km to the southwest, saw the introduction of domestic millet (Weber et al. 2010). There is growing evidence that millet cultivation spread progressively southward ultimately from the Yellow River basin. At Baodun 宝墩 in Sichuan for example, foxtail millet was cultivated with rice between ca. 2700–2000 BC (Guedes et al. 2013). Virtually the same date has been

obtained for the presence of rice and millet at Baiyangcun in Yunnan (Dal Martello et al. 2018).

When the forms and the decoration on ceramic vessels from an increasing number of Neolithic sites on the western margin of the Chao Phraya river floodplain are compared with those on the coastal sites, it is clear that there was very probably a separate migration route in question. This might well have involved the Salween River. Ban Kao is one of the first Neolithic settlements in Thailand to be examined. Sørensen's analysis of the pottery vessels found there pioneered identifying northern origins by suggesting that this site was occupied by farmers whose ancestry lies in the proto Longshan culture of the Central Plains (Sørensen 1972). It is not only the pottery vessels that are exotic to Southeast Asia. There were also

Fig. 15 Khok Phanom Di mortuary phase 6 included a row of burials that would have been contained within a mortuary structure to judge from the configuration of postholes. Left: the row showing the postholes; right: the burials revealed.



ground and polished stone adzes, a circular stone disc, and bone industry that involved arrowheads and harpoons. Sørensen's pioneer excavations of 1961–2 opened an area of 382 m² and a cemetery comprising 44 inhumation burials. These, with one exception of a flexed interment, were laid out supine with variable orientations divisible into an early and late Neolithic and one Iron Age phase (Fig. 6c; Sørensen and Hatting 1967).

There was little patterning to the Ban Kao burials: no clear nucleations are evident, although on four or five occasions, it seems that two adults were interred alongside each other. The mortuary offerings are consistent and offer little variation. Pottery vessels predominate, the number varying between one and twelve. These were often placed in groups beyond the head or feet, and on occasion may have been deliberately broken and strewn over the corpse. Stone adzes are the second most common offering. One or two individuals stand out from the majority on account of more abundant grave goods, but there is no question of a specific grouping of wealthy graves. Burial 10, for example, contained a male aged about 50 years, interred with the perforated stone disc, a bivalve shell, young pig's limb bones, and a modified deer's antler in addition to four pottery vessels and two stone adzes. Burial 11, a female aged about 30 years, wore a two-strand necklace of 644 disc-shaped shell beads that terminated in two long nephrite beads, and was also buried with the four distal limb bones from a young domestic pig, a bivalve shell, seven pots, and four stone adzes. The pierced *Anadara* shell on the chest of burial 14 is a marine species, indicating exchange over some distance. The ca. 40-year-old man in burial 15 was accompanied by six pots and an adze, and he wore a bracelet of 165 shell disc beads.

Sites with a similar repertoire are found south to the Thai/Malaysian peninsula, and their distribution has been further expanded recently with site surveys that have identified at least 40 sites presenting similar ceramics and or stone adzes to those from Ban Kao. Some of these are occupation and burial sites located on the riverine lowlands of the western Bangkok Plain; others are stone quarries and adze manufacturing sites in the uplands to the west. Excavations have concentrated over several seasons at the site of Nong Ratchabat, where occupation areas and a cemetery containing at least 111 inhumation graves have been uncovered (Doonsakul n.d.). Two major occupation phases have been radiocarbon dated, the earlier from ca. 2000–1400 BC, the latter from 1400 to 1000 BC. The dead, as at Ban Kao, were interred supine accompanied by numerous pottery vessels and stone adzes, the former often being broken prior to the insertion of the body into the grave. Some pot forms are an identical match to those from Ban Kao but others are distinct to this and nearby sites, particularly those embellished with human breasts, horns, and incised and impressed decorative patterns. As at Ban Kao, some wore personal ornaments, including stone and ivory bracelets and stone beads.

4.2 Ban Non Wat

Ban Non Wat is located in the upper reaches of the Mun River catchment on the Khorat Plateau of Northeast Thailand (Higham and Kijngam 2010). There are two phases of Neolithic occupation and associated human graves. The 31 burials in phase 1, comprising 17 adults and 14 infants or children, were dispersed across the excavated area with no obvious clustering or patterning (Fig. 6a). As with Khok Charoen, pottery vessels were the dominant grave good, with a maximum of nine with a young male who was also interred with two cowrie shells and three bivalve shells (Fig. 16). Shell beads were very rare, only one old male having a disc bead necklace. Five cowries were found with one female. Some pottery vessels were decorated with virtually identical incised and impressed designs to those from Khok Charoen and Khok Phanom Di (Fig. 17).

The finely incised and painted ceramics were no longer found with the second Neolithic mortuary phase to be replaced by cord-marked globular pots with a restricted neck and everted rim. The 28 adult and 10 infant or child graves were again dispersed, although on three occasions male and female adults were placed next to each other. The adults in this cemetery were poorly endowed with grave goods. Pottery vessels vary from none to just four. No shell disc beads were encountered; one male wore a single long shell bead and another had four strung as a belt. Infants and children were also very poor, being found with one or two pots.

4.3 Ban Lum Khao

Ban Lum Khao is located 15 km east of Ban Non Wat and incorporates in the first period of occupation a late Neolithic cemetery contemporary with Ban Non Wat Neolithic 2 (Higham and Thosarat 2004b). Ten graves were revealed, all having pottery vessels of similar form and finish to those from Ban Non Wat. Most had one or two pots, but one older female had ten as well as a marble bangle. A mid-aged male wore a shell disc necklace containing 786 beads.

4.4 Non Nok Tha

Non Nok Tha lies on the eastern edge of an upland on the north eastern margin of the Khorat Plateau (Fig. 2). The first two phases have been assigned to the Neolithic occupation (Bayard and Solheim 2009). There are 17 burials described as securely provenanced, and 17 less so (Fig. 6d). Of the former, 12 were infants or children. Compared with Khok Phanom Di, the Neolithic occupants of Non Nok Tha were decidedly poor, in terms of mortuary offerings. Five of the 34 individuals wore strings of disc beads, but no actual numbers are available. One person wore a shell bangle. Pottery vessels were the numerically dominant grave good with eight being

Fig. 16 A young Neolithic male burial from Ban Non Wat showing the cowrie shell ear ornaments and complete painted and incised/impressed ceramic vessels



found in the richest grave. Pig and cattle bones were also placed with some of those interred at this site during the Neolithic occupation (within the period 1500–1000 BC; Higham et al. 2014).

5 The Neolithic: Summary

Expansionary rice and millet farmers originating ultimately in the Yangtze and Yellow River flood plains infiltrated into southern China and Southeast Asia. Early farmers probably followed multiple coastal and riverine routes south, creating new settlements from about 2000 BC, possibly a century or two earlier. The importance of the coastal route is seen in the distribution of sites as one moves south from the Yangtze Delta. The Fuzhou Basin sites are a key link in this transmission (Ma et al. 2013; Higham Charles 2019). There is growing evidence that they interacted with the indigenous hunter-gatherers. There were distinct regional adaptations. Some early

farmers seem to have moved along the coast, settling in favored estuarine situations where conditions did not suit rice cultivation. They turned instead to fishing, hunting, and gathering. In the relatively dry KWPV, they preferred millet to rice, whereas in the wetter riverine habitats of the western Bangkok Plain and on the Khorat Plateau, rice was favored. Pigs and dogs were the principal introduced domestic animals in coastal Vietnam, but on the Khorat Plateau there were also domestic cattle.

The first farmers brought with them technical expertise in the manufacture, firing, and decorating of fine pottery vessels. They were skilled in crafting stone and hard shell beads, discs, and bangles. Whereas the indigenous hunter-gatherers they met in Southeast Asia interred the dead in a tightly flexed position with few if any mortuary offerings, the first farmers preferred an extended supine burial with a range of grave goods. There is a widespread similarity seen in the pottery vessels, adzes, and personal jewellery worn, the sprinkling of the corpse with red ochre, inclusion of animal bones, and

Fig. 17 Neolithic ceramic vessels from Khok Phanom Di (top row), Ban Non Wat (middle row), and Nong Ratchabat (bottom row)



placement of bivalve shells that are thought to represent fertility and rebirth.

The majority of the sites examined incorporated human burials with no evidence for an elite group identified on the basis of the rituals of death. This could take the form of an area or enclave of distinctly wealthy individuals of both sexes and all ages. Graves, for example at Ban Non Wat and Ban Kao, were usually dispersed with no clustering. However, Khok Phanom Di is an exception. Commanding an estuary, it was an ideal constriction point to control exchange transactions along the coastline and into the interior. It was also a center for the manufacture of pottery vessels. Here, we find mortuary phase 2–4 burials set out in tight family clusters with, on occasion, an individual interred with considerable wealth, measured in shell ornaments. During mortuary phases 3–6, specialist female potters were buried with the tools of their trade. One of these stood out as being spectacularly

wealthy, at the same time that two infants and a man were likewise very richly endowed with shell ornaments and ceramic vessels. This is important. We still have far too few Neolithic sites examined on the scale of Khok Phanom Di, but this site demonstrates that during this period, that lasted for about a millennium, a strategic location combined with technical expertise and ambition could fuel the rise of social aggrandizers. Khok Phanom Di is almost certainly not unique in revealing this.

6 The coming of copper-base metallurgy

The long debate over the chronology of the Southeast Asian Bronze Age has now been resolved: the first copper-base artifacts reached the region towards the end of the second millennium BC, and replicated in metal what had for long been

manufactured from stone or shell: axe/adzes, fishhooks, and bangles. Far less attention has been given to what is known of the impact of metal on communities with no previous exposure to it. Some hints can come from ethnographically-recorded instances of this occurring. Thus the brass objects brought to Cuba by the first European visitors had a sheen that gave them an even greater value than the gold used by the local elite. Even brass aglets were eagerly exchanged for gold due to their rarity, exotic origin, and supernatural qualities (Martín-Torres et al. 2007). These rapidly joined shell bead belts and quartzite necklaces as symbols of chiefly power.

How copper-base metallurgy reached East Asia has been greatly clarified over the past two decades by renewed research into its chronology and social implications. We find that the necessary mining, smelting, and casting skills spread from west to east, with stimuli from the Andronovo/Afanasievo cultures of the eastern steppes. At least four groups along the northern reaches of modern China from Gansu 甘肃 to Shandong 山东 were casting a limited range of tools and weapons in bivalve and open stone moulds during the third millennium BC (Pigott and Ciarla 2007). The adoption of bivalve mould casting was also taken up in the Central Plains during the rise of the Erlitou, Erligang 二里岗, and Shang states, but here, there was also a significant innovation in the development of piece mould casting for the production of sumptuary bronze vessels of such a size as to demand considerable quantities of copper and tin.

These state societies were already engaged in a widespread exchange network to obtain precious cowries and turtle shells. The middle reaches of the Yangtze River contain rich sources of copper ore, and between 1500 and 1300 BC, an Erligang period walled town was founded there with close ties with the Shang Dynasty center of Zhengzhou 郑州, 500 km to the north. As Liu et al. (2019) have shown, Panlongcheng 盘龙城 is also strategically placed to source and export the rich tin deposits of Guangdong 广东, the closest geographically to the state centers of the Central Plain. Two strategic rivers link lakes Dongting 洞庭 and Poyang 鄱阳 with Lingnan: the Gan 干 and Xiang 湘. Given the nearby presence of Tonglüshan 铜绿山 and Tongling 铜陵, among the largest copper deposits in East Asia, it is hardly surprising to find the development of a local bronze industry there by the mid second millennium BC, that fused local and Shang metal technology (Pigott and Ciarla 2007).

Just as with the expansion of rice and millet farmers, the river highways of Yunnan, Lingnan, and Southeast Asia were conduits for the movement of people experienced in the mining and smelting of copper ore, and the casting of socketed spears, axes, fishhooks, and bangles in bivalve moulds. Numerous sites in these linked regions attest to the presence of these specialists when they were interred in graves containing the tools of their trade, including bivalve stone and clay

moulds, crucibles, and furnace chimneys. Haimenkou 海門口 in the upper Mekong watershed of Yunnan is one such site, where a Bayesian analysis of radiocarbon determinations dates the uptake of copper-base metallurgy there to the fourteenth century BC. Slightly later, copper-base artifacts including knives, awls, fishhooks, bangles, and socketed axes were being cast in the area round Lake Dian 滇, dated at Hebosuo 河泊所 and Shangxihe 上西河 to the late second millennium BC (Fig. 18; Yao et al. 2020). Given the long history of exchange in the East and Southeast Asian interaction sphere, it is entirely to be expected that trade in copper-base artifacts as well as prospectors for ore sources came south to the farming communities of the Red, Mekong, and Chao Phraya river systems.

The arrival of bronze imports into Southeast Asia, and the first evidence for mining and casting by experienced founders, has been identified through the radiocarbon dating of both production and consuming sites. Southeast Asia is rich in copper and tin ores, and at least three copper sources were first mined at about the same time. The first is located at Vilabouly in upland Laos, where the earliest radiocarbon determinations place mining at ca. 1000 BC (Cadet et al. 2019). The same result comes from Phu Lon on the right bank of the Mekong River in Northeast Thailand. The KWPV in Central Thailand has several closely-spaced copper deposits, that were first exploited by ca. 1200/1000 BC (Higham et al. 2020). Four occupation sites that span the late Neolithic and early Bronze Age and distanced from copper ore sources have recently been dated. These dating initiatives have deployed the latest pretreatment protocols and Bayesian analyses to secure samples of charcoal, human bone collagen, shells, rice and millet grains, and weed seeds (Higham et al. 2014, 2015). The earliest secure contexts from Ban Chiang, which includes a burial containing a socketed bronze spear, date to ca. 1000 BC. Burials at Non Nok Tha and Ban Non Wat containing copper-base socketed axes have also been dated to the late second millennium BC. Ban Lum Khao does not have any bronze mortuary offerings, but the initial period of the Bronze Age there, deduced from pottery morphology, dates to the late second millennium BC. As far west as Central Myanmar, the same dates apply at Oakaei (Pryce et al. 2018).

This situation poses three intriguing questions. What was cast? How did the knowledge of copper-base metal penetrate Southeast Asia? And, did it have any discernible social impact when compared the preceding Neolithic communities that came into contact with metal? The first question is easily answered. Stone adzes, bone fish hooks and spears, and bangles laboriously fashioned from stone and shell were cast in the new medium of copper or a tin bronze alloy. At the key site of Ban Non Wat, the number of stone adzes recovered from Neolithic occupation layers declined dramatically with the advent of the Bronze Age. Due to an exceptionally fine-grained chronological framework for the mortuary sequence at Ban Non Wat, it is possible to advance our understanding of

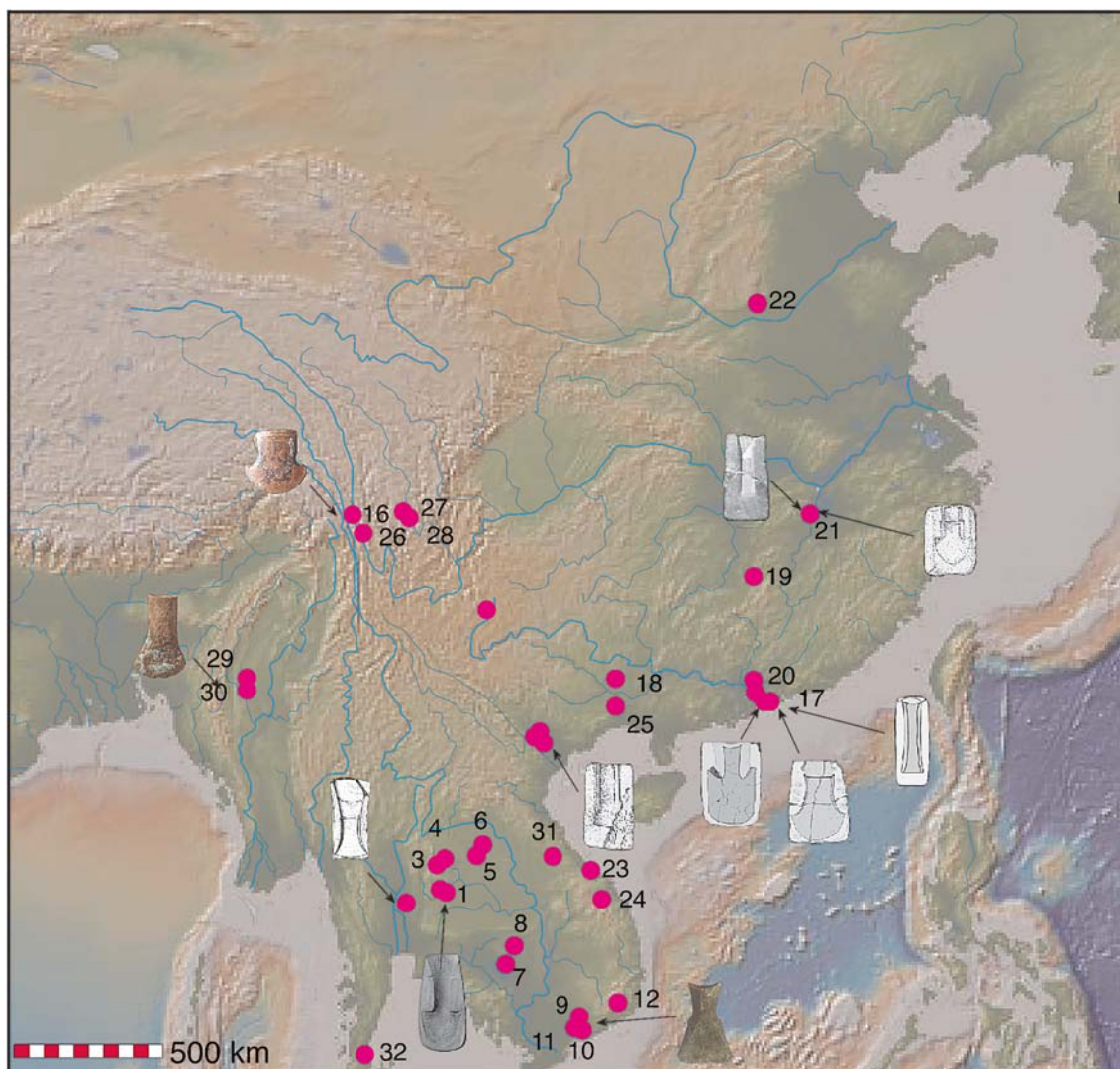


Fig. 18 Map showing the location of sites with deep socketed copper-base axes. 1. Ban Non Wat; 2. Ban Lum Khao; 3. Non Nok Tha; 4. Non Prawn; 5. Ban Na Di; 6. Ban Chiang; 7. Samrong Sen; 8. Mlu Prei; 9. Bung Bac; 10. Bung Thom, Go O Chua; 11. Doc Chua; 12. Phu My; 13. Go Mun; 14. Thanh Den; 15. Dong Den; 16. Haimenkou; 17. Zengchuanbu, Guoluwan, Shapucun, Nanshawan, Apowan, Tangxiahuan; 18.

Yuanlongpo; 19. Xinyan, Longxue; 20. Dameisha; 21. Wucheng, Xin'gan; 22. Anyang; 23. Binh Chau; 24. Lung Leng; 25. Gantuoyang; 26. Yinsuodao; 27. Yeshishan; 28. Jigongshan; 29. Oakaie; 30. Nyaung'gan; 31. Vilabouly; 32. Tham Than Nam Lot Yai; 33. Non Pa Wai; 34. Hebosuo, Shangxihe. Figure by C.F.W. Higham made using GeoMapApp (www.geomapp.org), CC by Ryan et al. (2009)

how knowledge of and expertise in metals was transmitted. Thus, it is now increasingly clear that the repertoire of Southeast Asian early bronzes recurs across Lingnan and Yunnan at a slightly earlier date. This is seen in the new chronology for Haimenkou for example. The earliest set of burials with copper-base socketed axes at Ban Non Wat followed seamlessly from the late Neolithic graves and contained similar forms of ceramic vessels, albeit in greatly increased numbers and a higher quality of finish (Fig. 19). The lead isotope signature (LIS) for one of these axes does not match that for any of the three known Southeast Asian copper mines. It is considered highly likely that it was an import from a southern Chinese source. However, only a generation or two later, the copper ore of the KWPV was being mined, and

founders were interred with the moulds and socketed axes for which they were responsible. By the second Bronze Age mortuary phase at Ban Non Wat, the LIS for the samples from copper-base axes matches that for the KWPV. There is therefore, little doubt that by this period, ca. 900–1000 BC, a community with sufficient technical knowledge to mine, smelt, and cast copper-base axes occupied Non Pa Wai in the KWPV.

The exchange of copper either as ingots or finished castings covered great distances, a fact that is not as surprising as it might seem, given the expanse over which cowrie shells were traded into the Central Plains of China during the preceding centuries. The LIS for the early bronze spear from Ban Chiang has identified its origin at the Vilabouly complex in upland

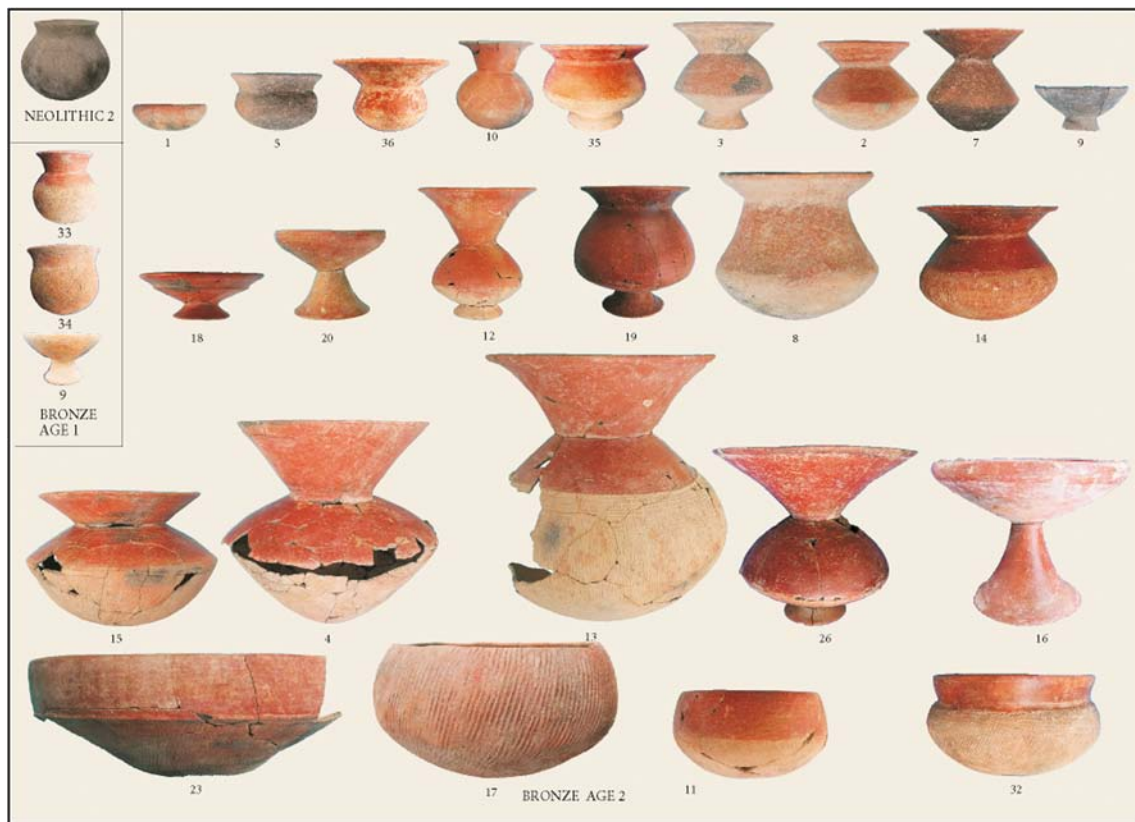


Fig. 19 The ceramic vessels from the late Neolithic and the first and second phases of the Bronze Age at Ban Non Wat, showing the remarkable increase in form, quality, and variety

Laos, 270 km to the west. The copper in an early axe from Oakaei in Central Myanmar also came from the Laos mines over a distance of 1200 km.

At Ban Non Wat, the first copper-base artifacts coincided with some intense changes in mortuary rituals. There are three early phases of Bronze Age burials. In the first, which comprises a small sample of just seven graves, the dead were interred in larger and deeper graves, and the number of pots increased markedly, although of the same form as their Neolithic predecessors (Fig. 19). All three adults, a 10-year-old child, and an infant were interred with a copper-base axe. There was then a dramatic evolution in the rituals of death at this site. The dead were interred in neat rows with no intercutting or disturbances (Fig. 20). The repertoire of ceramic forms greatly increased with a variety of complex forms and painted designs. The number of vessels placed in graves exceeds that found in any preceding or contemporary site in Southeast Asia. Men, women, and infants wore multiple exotic marine shell bangles and earrings fashioned from trochus and tridacna shell as well as exotic marble bangles and earrings (Figs. 21 and 22). Some of the dead wore necklaces and belts made from thousands of shell disc beads. Males in particular, but some women and infants, were buried with a socketed copper-base axe. There were also copper-base artifacts interpreted as awls and chisels, and one man wore an

anklet comprising 25 bells. An infant wore 30 such bells also as anklets. Some of the dead were partially disinterred, and then reburied. Graves of infants and adults were far larger than was necessary to accommodate the body. The extreme wealth of this group continued for several generations before, in later stages of the Bronze Age sequence, mortuary wealth fell markedly.

One of the most significant facts about this rich enclave of individuals, is that there were contemporary much poorer graves elsewhere on this site, and at least one other site in the vicinity. There is a cemetery at Ban Lum Khao in which again, the early Bronze Age graves continue directly from Neolithic predecessors. There are 93 graves of adult males and females, children, and infants laid out in rows. The difference in terms of wealth between the two contemporary assemblages is most marked. There is a very limited repertoire of pot forms that are contemporary with the florescence of wealth seen at Ban Non Wat, the most in any grave at Ban Lum Khao being 15 against 82 for Ban Non Wat. Bronzes were entirely absent. Many individuals lacked any shell disc bead jewellery, the most from any grave being 2595 with a young female strung as necklaces and belts. She also wore three marble bangles and one made from tridacna shell. The next wealthiest, in terms of shell beads, was an infant with just 160. Other grave goods, all in comparatively modest amounts at best,

Fig. 21 Ban Non Wat Bronze Age burial 196 showing the shell bangles, bead necklace, and earrings

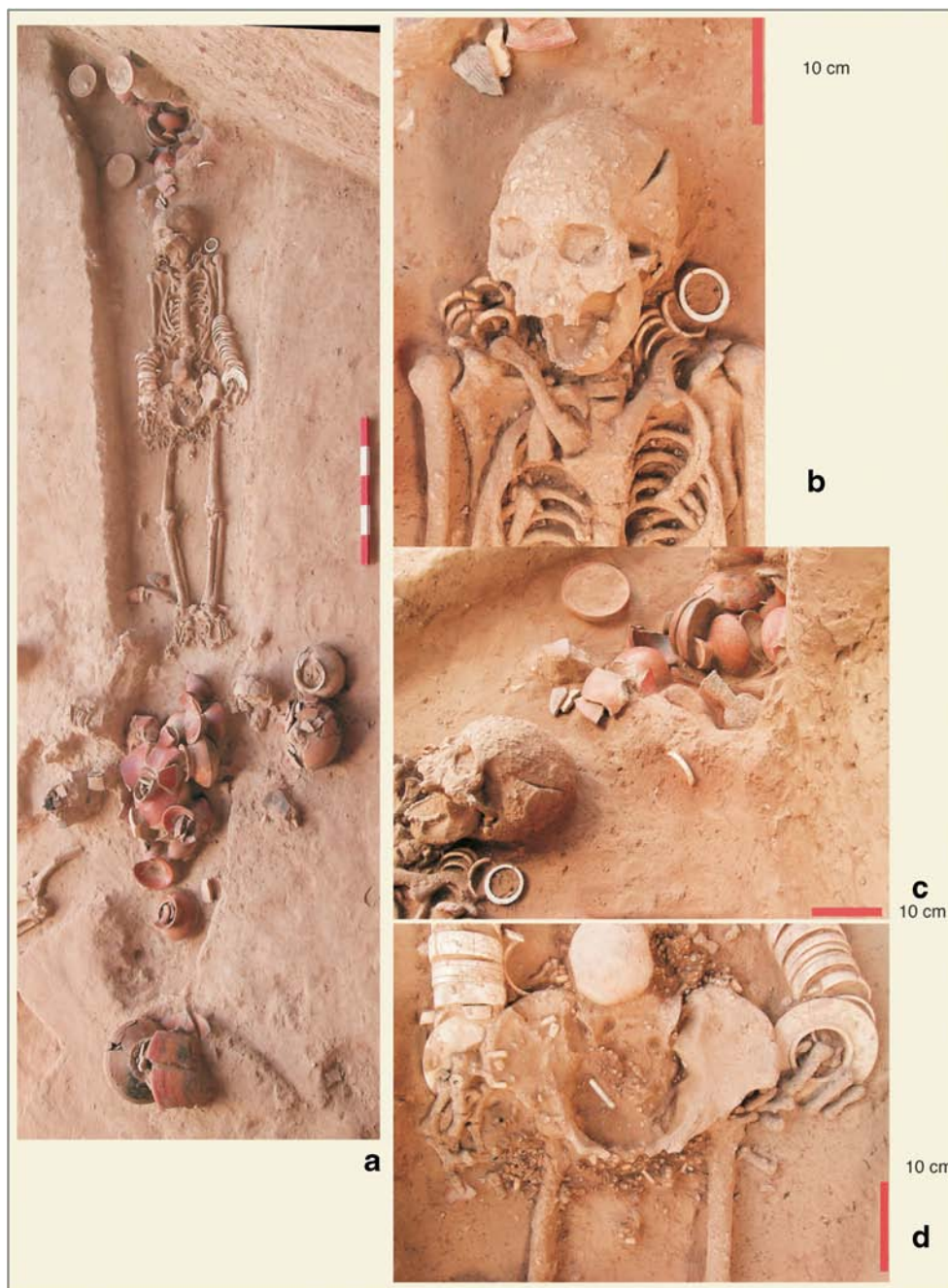


bangle or string of shell beads predominated. This phase developed, at about 1000 BC, into one in which copper-base axes and moulds were also placed with some of the dead. However, as at Ban Lum Khao, there was little change, if any, in the quantity and range of grave goods. The assemblage is dominated by pottery vessels, the most being found with any individual being 21, but the average from 25 burials being seven. Shell beads and bangles continued to be very rare, with one person wearing two trochus shell bangles. Bronzes were confined to bangles and socketed axes. One female wore 17 bronze bangles, a male was interred with a socketed axe. Some bronzes at least were locally cast judging from the axe moulds found in a handful of the graves.

7 Discussion

Southeast Asia was on the direct path of an early expansion of anatomically modern humans that originated in Africa. The hospitable climate and high bioproductivity made it, for well over 50 millennia, an ideal environment for sustaining hunters and gatherers, some of whom survive in remote habitats to this day (Higham 2013). Southeast Asia is also particularly susceptible to the loss or gain of land with a fluctuating sea level, since much of the now submerged Sunda Shelf was exposed during cold phases of the last glacial. There can be little doubt that this drowned area would have sustained hunter-gatherer communities that perforce moved inland as the sea level rose

Fig. 22 Ban Non Wat Bronze Age burial 262 showing the shell bangles, bead belts, and earrings



by over 100 m from ca. 11,000 BP during Marine Isotope Stage 1. From ca. 6000 years ago, the sea rose above its present level and formed now raised beaches. Settlements on these, particularly in coastal Vietnam, allow a glimpse of sedentary hunter-gatherer societies particularly well documented at the site of Con Co Ngua.

Here, an occupation site incorporating a substantial burial ground, dated to at least the early seventh millennium BC, has revealed how the wealth of natural resources were tapped: there are the bones of wild water buffalo that dominate numerically as well as deer, macaques, and wild dogs. Estuarine,

deep sea, and freshwater fish were consumed and canarium nuts were collected. The hunter-gatherers made round-based pottery vessels with exterior surfaces impressed with vertical ribbing. They used ground and polished stone axes and bone and shell tools. The excavated burial ground contained 172 graves (272 for all excavation seasons) in which the body was interred either in a seated squatting position or flexed on the side, often after chopping long bones and relocating the head to fit the corpse into the grave. Other than a bracelet of porcupine teeth, no mortuary offerings were identified (Oxenham et al. 2018). This pattern of material culture and mortuary

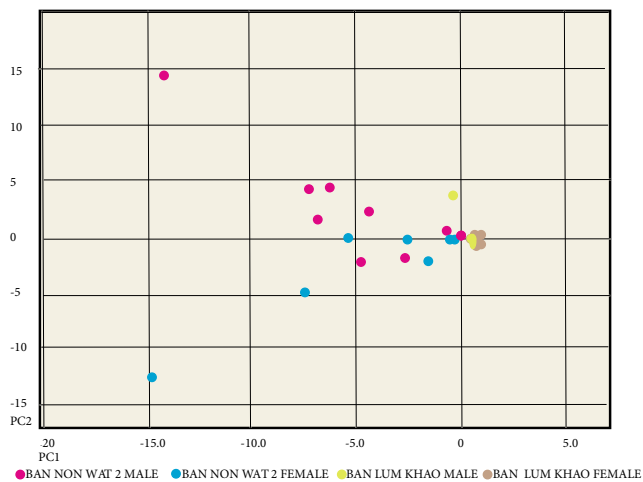


Fig. 23 The principal components 1 and 2 computed from the mortuary offerings in individual Bronze Age 2 adult graves from Ban Non Wat and Ban Lum Khao. Note the similarity between all those from the latter site

practices is also found in many sites in Lingnan of the Dingsishan 顶狮山 culture.

Interpretations of the later hunter-gatherer occupation of Southeast Asia has for long portrayed adaptation on the basis of small inland rock shelters ascribed to the Hoabinhian complex. These were seen to reflect small and transient groups that present a marked contrast to the large, sedentary coastal and riverine communities illuminated at Con Co Ngua and many related sites, best described as complex hunter-gatherers who were to be confronted by the demographic expansion of farmers moving into Southeast Asia from the north by multiple routes at different times, and adapted to the new social and physical environments they encountered in different ways.

The domestication of pigs, bovinds, rice, and millet in the Yangtze and Yellow river regions set in train the demographic expansion of communities that counted food production as part of their subsistence. The people involved can be distinguished from the indigenous hunter-gatherers of Southeast Asia genetically and by their DNA and cranial and dental morphologies. This expansion of farmers established an East and Southeast Asian ecumene that witnessed the exchange of knowledge, and material goods over a period exceeding two millennia. There is a generality to some aspects of the behavior of the colonizing farmers. They interred the dead in burial grounds in an extended supine position with rituals that included the placement of mortuary offerings. They made pottery vessels to a far higher quality than the indigenes they encountered, and decorated them with complex incised, impressed and painted designs that present common features over an extraordinarily wide area. Their manufacturing skills included the arduous manufacture of hard stone and shell beads, bangles, and discs with a long ancestry in their original homelands. The placement of large bivalve shells with the dead recurs in many widely dispersed settlements, an act that

like the presence of cowrie shells, might well symbolize fertility and rebirth.

One route of ingress from the north probably followed the coast of Lingnan into the strategic region of the lower Red River. Known after the eponymous site of Phung Nguyen, the sites include Man Bac, where the new arrivals integrated with the indigenous hunter-gatherers. They cultivated rice, raised domestic pigs, hunted, and fished. The human burials were of modest and uniform wealth. This contrasts with the slightly later Phung Nguyen site of Lung Hoa, where the graves, up to 5 m deep equipped with ledges, contained individuals with wealth expressed in exotic jade *yazhang* blades, a *ge* 戈 halberd, and nephrite beads, bangles, and earrings reflective of the local manufacturing facility at Trang Kenh. The *yazhang* blades, also found at the sites of Xom Ren, Phung Nguyen, and Khu Duong, place the later Phung Nguyen Neolithic sites within a ritual orbit that includes Erlitou and Sanxingdui, iconic early state societies to the north. These late Neolithic burials strongly suggest that there was an elite element in Phung Nguyen society in which through down the line exchange, *yazhang* and *ge* halberds were traded south.

Probably by following the coast, Neolithic communities early settled the Dong Nai river flood plain. An Son was occupied at about the same time as Man Bac and occupants cultivated rice and maintained domestic pigs and dogs. The mortuary rituals are typical of the early Neolithic, following the tradition of extended supine inhumation. The available sample from An Son does not include any individual or group that stands out on the basis of mortuary wealth.

The first inhabitants of Khok Phanom Di settled into one of the richest habitats known in terms of bioproductivity, the tropical estuary. The mangrove forests that crowded round the settlement provide through their constant leaf fall, the basis of a food chain that sustains a uniquely rich marine ecosystem. The downside is that rice is not adapted to saline conditions. The biological samples from this site are dominated by fish and shellfish. Domestic mammals are rare to absent for much of the cultural sequence other than the dog. Rice is present in limited amounts other than when there was a temporary fall in the sea level when fields were cultivated with stone hoes and harvested with shell knives. A key issue with Khok Phanom Di is that it commanded a constriction point for communication and exchange. The estuary provided access to the hinterland, the coast, and to other settlements. It also had immediate access to high-quality potting clay. Exchange brought stone adzes, granite hoes, red ochre, and exotic shell for complete ornaments or their manufacture into ornaments.

In the first two or three centuries, the dead were interred in nucleated groups probable within mortuary chambers. Some individuals were elite in the sense that they wore markedly more exotic shell ornaments than their contemporaries. Following the brief interlude of lower sea level and reversion to marine conditions, the old nuclei were abandoned and a

woman specialist potter and an infant beside her were interred with mortuary wealth unparalleled, save for the wealthy Phung Nguyen graves, in Neolithic Southeast Asia. A man of the same phase was also outstandingly rich. Defined mortuary structures were also constructed in the next phase, one containing wealthy females, the other a row of men, women, and infants that were markedly poorer. This manufacturing center and trading hub was thus occupied by a community that recognized personal prowess and achievement displayed through the ownership of shell jewellery and ostentatious burial rituals. Unlike the other Neolithic sites examined, the dead were consistently placed in clearly defined clusters that accumulated over multiple generations. This characteristic, it is suggested, might well reflect a marker between ancestral graves and the ownership of land and its resources, in the case of Khok Phanom Di the central constriction point through which and from which desirable goods flowed. Likely trading partners lie between 180 and 220 km to the north at Khok Charoen and Non Pa Wai, where at the latter site, the occupants cultivated millet (Weber et al. 2010, D'Alpoim Guedes et al. 2020).

The many Neolithic settlements on the western margins of the Central Bangkok Plain are characterized by a distinct pottery tradition seen in the burials of Ban Kao and Nong Ratchabat. Similar pottery vessels are found in further settlements down to peninsular Thailand and northern Malaysia. The Salween River is the most likely route for this distinct Neolithic tradition, as suggested initially by Sørensen (1972), thus linking this region with Yunnan, where rice and millet were grown at the site of Baiyangcun by ca. 2500 BC (Dal Martello 2018). The two principal cemeteries of this group are similar in the form and number of pottery vessels, pig bones, and stone adzes and shell ornaments placed with the dead, though unlike Khok Phanom Di, graves were not demarcated in distinct groups and no individuals stood out on the basis of mortuary wealth.

The initial Neolithic occupation of the broad expanse of the Khorat Plateau seems on current evidence to have been a few centuries later than the coastal sites and those of the Ban Kao group. At Ban Non Wat, the earliest contexts are in the eighteenth century BC and two centuries later at Ban Chiang and Non Nok Tha. There are some grounds for suspecting that, as at Man Bac, there was a mixed population of incoming farmers and indigenous hunter-gatherers at Ban Non Wat, judging from the flexed burials with distinctive mortuary offerings and isotopic evidence for a different diet (King et al. 2013). Again, the extended and supine Neolithic burials at Ban Non Wat are not found in distinct groups, and there is no evidence of distinctly wealthy individuals there or at Non Nok Tha.

Given the progressive expansion of expertise in copper-base metallurgy eastward into Northwest China and the Central Plains, it is almost to be expected that in due course,

the Neolithic inhabitants of Southeast Asia would become familiar with copper or bronze artifacts through their transit along long-established exchange routes, or the movement south of prospectors and experienced smelters of copper and tin ores. As with the earlier expansion of farmer communities, it is unlikely that only one route was followed. Ciarla (2007) for example, has traced the southerly expansion of copper-base technology through the river routes linking the middle reaches of the Yangtze with Lingnan, while Chiou-Peng (2018) has traced a second route linking Sichuan and Yunnan with Southeast Asia (Fig. 24). Yun and Scott (2020) have supported the validity of this particular route, showing how both in Yunnan and Southeast Asia, early founders cast a similar range of socketed axes, bangles, and fishhooks in unalloyed copper.

Assessing the social impact of copper-base metallurgy in Southeast Asia is a rapidly developing field with two principal models in question. The first has been generated by the mortuary data principally from Ban Na Di, Non Nok Tha, Ban Chiang, and Ban Lum Khao that has failed to identify any evidence for the rise of a social elite. While burials in one part of Ban Na Di were richer than their contemporaries in another, this was modest at best. Nor is there currently any evidence suggesting that a social elite oversaw mining and production. Thus, under this model there was little if any social change from the late Neolithic. Copper-base technology was undertaken within village-based communities ordered on the principles of heterarchy. There was no preferential access to, or ownership of, valuables employed to indicate status. The wide and generalized distribution of resources meant that there was no elite control over production or exchange (White and Hamilton 2019).

One problem with this model is the tenuous nature of the evidence. Excavations have been limited to very small areas compared with the overall size of each site. At Ban Lum Khao, the excavations sampled the site periphery only due to looting and the presence of modern houses. There is very little evidence at all for the domestic component of the mining and production sites. Moreover, Non Nok Tha, Ban Chiang, and Ban Na Di were all located some distance from any major exchange route or constriction point. Ban Non Wat, by comparison, is located where copper, marble, and marine shell from Central Thailand would funnel onto the broad expanse of the Khorat Plateau. Moreover, the upper Mun Valley is to this day renowned for its deposits of salt, an important resource for the preservation of wet season fish for dry season consumption. Excavations took place in the center of the site and for Southeast Asia, on an unprecedented scale.

A secure chronological framework is the bedrock upon which the interpretation of this site is founded. We now know that the earliest securely provenanced copper-base artifacts—deep socketed copper axes—come from burials dated to the eleventh century BC. The lead isotope value for one of these

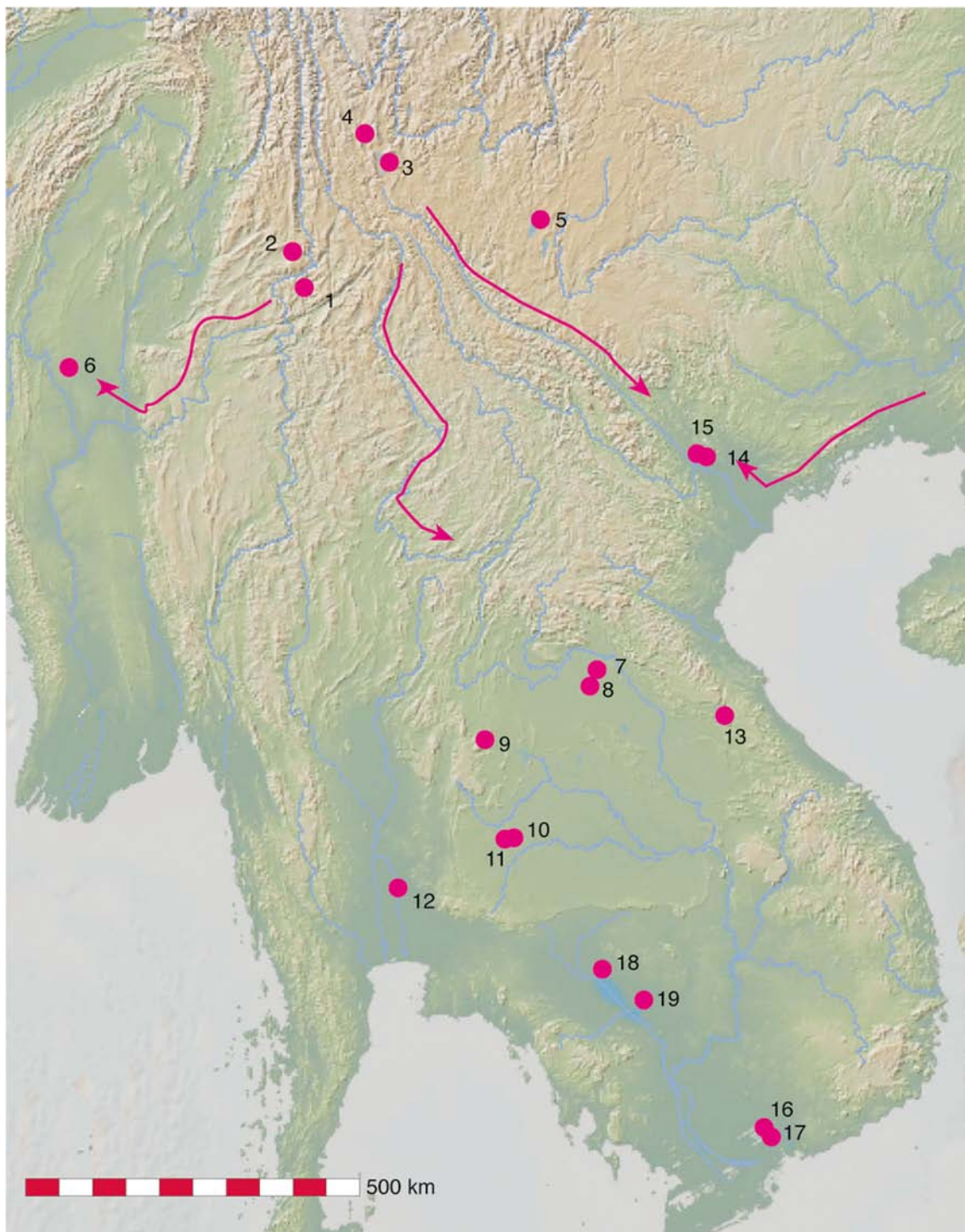


Fig. 24 Map showing the likely routes of expansion of knowledge of copper-base expertise into Southeast Asia from Yunnan. 1. Shifodong; 2. Dahuashi; 3. Yinsuodao; 4. Haimenkou; 5. Hebosuo, Shangxihe; 6. Oakaei; 7. Ban Chiang; 8. Ban Na Di; 9. Non Nok Tha; 10. Ban Lum

Khao; 11. Ban Non Wat; 12. Non Pa Wai; 13. Vilabouly; 14. Dong Dau; 15. Thanh Den; 16. Dong Dau; 17. Bung Bac; 18. Koh Ta Meas; 19. Samrong Sen. Figure by C.F.W. Higham made using GeoMapApp (www.geomapp.org), CC by Ryan et al. (2009)

does not match any of the three known copper mines in Mainland Southeast Asia. It might therefore have come to the site as a traded valuable over some distance, and its form points to a northern source. The few burials of this initial

Bronze Age phase were markedly wealthier than their immediate Neolithic predecessors, both in terms of ceramic vessels, shell ornaments, and copper-base axes. At this same juncture, mining and casting began in the KWPV at Non Pa Wai, where

the burials contained moulds and copper-base axes and fish-hooks (Higham et al. 2020). The lead isotopes link the Bronze Age 2 metal with the KWPV mines.

The Bronze Age 2 cemetery at Ban Non Wat presents a nexus of innovations that requires a re-evaluation of social changes as copper-base technologies were established in Southeast Asia. Men, women, and infants were interred with elaborate rituals in graves larger than was necessary to accommodate a coffin, in order to create space for greatly expanded quantities of mortuary offerings. These particularly centered on ceramic vessels of many forms that were often elaborately decorated (Fig. 19). Not one of the dead was accompanied by an anvil or burnishing stone indicative of being a potter, indeed the quality of the pots is compatible with specialist production. These vessels might well reflect funerary feasting. The burials were placed in discrete rows centrally within the settlement that, as at Khok Phanom Di six centuries earlier, hints at a relationship between a social group and ownership of resources. The quantities of shell and marble ornaments worn by the dead, as well as the copper-base axes, chisels, awls, bells, and anklets, are far greater than at any comparable site in Southeast Asia. Some of the dead were exhumed and then reinterred, as if they were known and revered ancestors. There are thus grounds for identifying the rise of social aggrandizers that coincided with the injection of exotic new valuables into exchange networks that included marine shell, exotic marble, and copper-base metal. The key point of the upper Mun sites is their location at a constraining choke point west of a pass over the Petchabun Range.

8 Conclusions

The later prehistory of mainland Southeast Asia was shaped by its integration with East Asia into a major interaction sphere. With its consistently warm climate and natural abundance of food resources, there was little stimulus to plant domestication and animal husbandry for at least 50 millennia of occupation by anatomically modern humans. An elevated sea level and formation of shorelines now many km inland have made it possible to identify complex sedentary hunter-gatherer communities whose ancestors would, one assumes, have occupied extensive maritime habitats now drowned with the post-glacial rise in the sea. In Lingnan, related hunter-gatherer communities occupied the riverine locations.

The domestication of rice and millet was a lengthy process that took place in the Yangtze and Yellow River floodplains that underwrote the proliferation of sedentary farmer communities (Fuller et al. 2010). We can now call on new evidence derived from ancient DNA and cranial morphology as well as a common material culture document a series of southward expansionary movements that brought Neolithic farmers to the monsoon lands of Southeast Asia, the coast and rivers

being the lines of least resistance in terms of the routes that were taken. It is argued that aDNA, seen in Europe as the clinching evidence for how farmers and farming spread, is now emerging in Southeast Asia as the key to documenting the actual expansion of people that supports an archaeological model (Lipson et al. 2018; McColl et al. 2018). As far as the chronological evidence goes, it is evident that there was not a blanket spread of farming across the face of Southeast Asia. On the contrary, lines of least resistance to expansionary settlement favored the coast and main rivers. Thus, where Man Bac and Khok Phanom Di was occupied by at least 2000 BC, remote inland sites such as Non Nok Tha and Ban Chiang were first settled about five centuries later. Again, there were multiple routes of ingress, from the Salween River route that probably brought the first farmers from Yunnan to Ban Kao and Non Ratchabat to the coastal route involving the Neolithic settlement of the lower Red River valley. The foundation of settlements as at Man Bac and Khok Phanom Di entailed adaptation to the conditions that were encountered. Where possible, rice or millet were cultivated and domestic pigs, dogs, and cattle were maintained in addition to fishing and collecting and hunting wild resources. The diet of those living in marine estuarine situations unsuited for rice cultivation centered on fish and shellfish.

An exchange network saw marine shell such as cowries, high quality stone, and pottery vessels cross the landscape. Doubtless less durable items were also traded. Some communities specialized in the manufacture of pottery vessels, others nephrite ornaments. The dead were interred within the confines of their settlements, and the general uniformity of individual wealth expressed in mortuary offerings suggests that social distinctions were limited. However, Khok Phanom Di is an exception. Located in a highly strategic estuarine location, and for long a major ceramic manufacturing center, graves were strictly nucleated over time with some individuals being unusually well endowed with ornaments, culminating in two mortuary phases of extreme wealth. This site is unlikely to be alone in stressing the important relationship between strategic control of a constriction point for trade, a vigorous and skillful manufacturing presence, and the rise of socially elite individuals within the community. One point, however, cannot be stressed too strongly: the impact of farming was not uniformly felt. Even into the present, hunter-gatherers survive in the more remote forests of Peninsular Thailand (Higham 2013).

One of the most significant results of Pryce's research on characterizing the copper sources on the basis of lead isotopes is the remarkable distances over which the early metals were exchanged. Thus copper from the Vilabouly mines ended up in Central Myanmar, a passage that went across the grain of the intervening uplands and river crossings (Pryce et al. 2018). This emphasizes the comparative ease with which the flow of goods, people, and ideas could have travelled along the riverine routes linking Yunnan and Lingnan with points north and

south. These routes, such as the *Shu Shendu* road 蜀身毒道 linking Sichuan with Southeast Asia and India, would have sent cowries north and copper south (Yun and Scott 2020). There is growing and convincing evidence that bronzes reached Southeast Asia from Myanmar to Thailand and probably Vietnam at about the same time, towards the end of the second millennium BC. The copper-base artifacts cast closely mirrored their predecessors fashioned in stone and shell.

The impact of metals on prehistoric societies is not uniform. In the Central Plains and Sichuan and at Panlongcheng in the middle reaches of the Yangtze River, massive bronzes were cast in innovative piece moulds by specialists in state-sponsored ateliers. Indeed the search for new sources of copper and tin to satisfy these demands probably affected the movement of specialists and the transmission of technical knowledge to the south. The Southeast Asian Bronze Age offers a stark contrast to those early states. In nearly all instances where there is a documented transition from the late Neolithic into the early Bronze Age, there was no discernible social change, at least expressed in the mortuary rituals. Ban Non Wat, however, lies in a strategic location for the exploitation of salt and participation in a trade artery. Here, we do find a rapid rise in the presence of an elite lineage of aggrandizers that endured for several generations, and employed copper-base axes, marine shell and marble ornaments, fine ceramic vessels, and elaborate burials to advertise their elevated social status.

The most significant finding in this overview is that the prehistory of Southeast Asia was so entwined with that of Lingnan, Yunnan, and the extensive lands to the north, that only by conjoining both can its remote past be fully understood.

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