THE NEOLITHIC OF VIETNAM

By Philip J. Piper[1], Lâm Thị Mỹ Dung[2], Nguyễn Khánh Trung Kiên[3], Nguyễn Thi Thuy[4], Charles Higham[5], Fiona Petchey[6], Elle Grono[1] and Peter Bellwood[1].

[1]School of Archaeology and Anthropology, Australian National University, Canberra, Australia

[2]Department of Archaeology, VNU University of Social Sciences and Humanities, Vietnam National University Hanoi

[3]Center for Archaeology, Southern Institute of Social Sciences.
No.49 Nguyen Thi Minh Khai, Ben Nghe Ward, District 1, Ho Chi Minh City, Vietnam

[4]Vietnamese Institute of Archaeology, Hanoi, Vietnam

[5]Department of Anthropology and Archaeology, University of Otago, New Zealand

[6]Faculty of Science and Technology, University of Waikato, New Zealand

Abstract

The Neolithic in Mainland Southeast Asia is considered to be the period of human prehistory that commenced with the transition from hunting and gathering into mixed economies of foraging and farming. It lasted until the appearance of copper and bronze metallurgy and thus dates between *c*. 2500 and 1200 BC. In Vietnam, Neolithic sites and cultures are recorded especially around the edges of the Red River delta, along the northern and central coasts, and in the southern river basins between the Đồng Nai and lower Mekong. This period of Vietnamese prehistory was characterised by the southwards movements of East Asian Neolithic populations from southern China across Mainland Southeast Asia, the introduction of cereal cultivation (rice and foxtail millet), and the management of domesticated pigs and dogs. The Neolithic of Vietnam also reveals material culture relationships extending from southern China to central Thailand. Recent research is also starting to highlight social and cultural diversity during this period, together with the development of significant exchange networks.

Vietnam on the Eve of the Neolithic

In the early to mid-Holocene (*c*. 9000–3000 BC), hunter-gatherers with Hoabinhian and Bacsonian lithic technologies inhabited the northern regions of Vietnam, although little is known about pre-Neolithic settlement in the south. In the north, many occupation layers belonging to this period have been recorded in interior karst limestone caves and open air shell middens, the latter along the coastline at sites such as Cái Bèo, Soi Nhụ, Đa Bút, Quỳnh Văn, Thạch Lạc and Bàu Dũ (Figure 1). Hoabinhian assemblages contain only flaked stone with rare examples of edge-grinding, whereas Bacsonian lithic assemblages are primarily characterised by

hammer-dressed and edge-ground axes, together with pottery (Nguyễn, K.S. et al. 2004). The inhabitants of caves such as Hang Chổ in Hòa Bình Province hunted a diversity of vertebrate faunas, collected terrestrial and aquatic molluscs, and processed a variety of nuts and seeds using pounders and large hollowed stone mortars (Yoneda 2006). Many caves of the Hoabinhian culture like Hang Chổ, Làng Cườm and Mái Đá Nước were also utilised for burying the dead, predominantly in flexed and more rarely in squatting positions (Matsumura et al. 2006; Nguyen, K.S. et al. 2004, Oxenham et al this volume; Tayles et al. 2015).

FIGURE 1 HERE

To the north, in what is now southern China, comparable assemblages have been recorded from numerous caves in Jiangxi and Guangxi Provinces. These communities produced lithic tools similar to those of their Vietnamese contemporaries, hunted a variety of deer species, caught fish and turtles, and collected molluscs, nuts and berries. Possible charred remains of *Dioscorea* sp. (yam) and *Colocasia* sp. (taro) have also been recorded at Zengpiyan (Zhang and Hung 2012), underlining the utilisation of tubers.

From *c.* 7000 BC onwards, settlements of the Dingsishan Culture appeared along river terraces in Guangxi and in western Guangdong (Fu 2002). These consist primarily of large shell mounds with segregated cemeteries and locations for dumping refuse. Artefacts recovered include polished stone axes, adzes and points, bone awls, needles, spears and hooks; and knives of shell. The pottery is quartz tempered with parallel ribbing in the early phase, and crushed shell and sand tempered with cord-marking later. These people practised broad spectrum foraging with a diversity of mammals, reptiles, birds and fish hunted. They collected molluscs and plants (Zhang and Hung 2012), and may have also managed sago palms, sedges, bamboo and other useful economic crops, as recorded (with rice) from starch and phytoliths on the ends of stone pounders from the more recent Neolithic site of Xincun in Guangdong Province, dating to *c.* 3500–2500 BC (Yang et al. 2013).

Domestic dogs were supposedly present at Dingsishan from 5000 BC onwards, but close examination of the faunal lists in Lu (2010) suggests that they were only recorded during the later phases of occupation, and in association with the first evidence for rice. Although inhumations were placed in open cemeteries rather than caves, postures continued to be mainly flexed or squatting. Such burials often demonstrate clear evidence of body mutilation and dismemberment, as at Dingsishan itself (Li et al. 2013; Matsumura et al. 2017).

Similar open-air settlement sites emerged in northern Vietnam from around 4500 BC onwards, and appear to be related culturally to those in Guangxi, including Dingsishan (Zhang and Hung 2012). The Vietnam assemblages are termed Đa Bút, after the eponymous shell mound and burial site of Đa Bút in Thanh Hoa Province (Patte 1932; Nguyễn, K.S. 2007; Nguyễn, K.S. et al. 2004, Nguyễn, V. 2005). The Đa Bút culture (10 sites) existed for over 3000 years, and consists of three phases, from early to late. The sequence of phases is based on changes in landscape occupation

(from cave sites to open landscape), lithic technologies (the emergence of edge and then full grinding of pebble axes) and economic structure (predominantly terrestrial to estuarine/coastal resources), supported by some absolute dating.

The earliest Đa Bút phase is considered to have lasted from 7000–5000 BC (Hang Sáo, Hang Mòi and Mái Đá Vàng sites) (Nguyễn, K.S. 2013); the middle to around 4000 BC (Đa Bút, Cồn Cổ Ngựa, Bản Thủy), and the late from 3000–2000 BC (Gò Trũng, Làng Còng, Đồng Vườn). Đa Bút sites with pottery and hammer-dressed and ground pebble axes have also been recorded in Ninh Bình and Hà Nam provinces (Trịnh, H.H. and Huffer 2015). These communities produced coarse sand- and quartz-tempered pottery, which was often covered externally with shallow parallel grooves made by lightly rolling a vine-wrapped paddle down the side of the pot (Bellwood 2015: Figure 2; Bellwood 2017: Figure 5.3).

The early phase of the Đa Bút was characterised by edge-ground axes, and more extensively polished stone implements began to appear within the later phases, perhaps around 3000 BC (Figure 3). The dead were buried in relatively large cemeteries, for example at Cồn Cổ Ngựa, where more than 200 inhumations dating to *c.* 4500 BC have been recorded. These individuals were interred in a squatting position, or side-flexed in the later phases of interment (Oxenham et al. 2018; Figure 4). Based on nonmetric dental traits, all the measurable individuals interred at Cồn Cổ Ngựa were of Australo-Papuan (sometimes termed Australo-Melanesian) morphology (Matsumura and Oxenham 2014; Matsumura et al. 2019).

Another pre-Neolithic forager community, named after the Quỳnh Văn site, emerged around 3500–3000 BC in Nghệ An and Hà Tĩnh Provinces, along the north-central coast of Vietnam, 250 km south of Hanoi. Quỳnh Văn shell mounds consist almost exclusively of the flat estuarine pearl-like bivalve *Placuna placenta*. Originally located on the coast during the mid-Holocene, some of these sites are now quite some distance inland as a result of coastal alluviation and a subsequent slight drop in sea level. Recent excavation at the *Placuna placenta* mound of Rú Điệp in Hà Tĩnh Province has recorded large postholes and *in situ* fireplaces, indicating that the mound builders were intermittently constructing dwellings on top of the accumulating shells (Lam et al. in review).

Quỳnh Văn pottery has a characteristic pointed base and generally combed decoration. These sites have also produced bone spear points and other osseous implements. Most stone artefacts are cores and flakes, but a single bevel fragment of a polished adze/axe was recovered from the well-stratified deposits at Rú Điệp dating to *c.* 3270-3080 cal. BC (Lam, L.T.D. et al. in review). The people at Quỳnh Văn and Phái Nam buried their dead in flexed or squatting positions similar to those in Dabutian sites (Nguyễn, K.S. et al. 2004). Rú Điệp appears to be an exception, however, since the single excavated burial from here was interred in a fully extended position (Lam, L.T.D. et al. in review).

The construction of shelters and the production of considerable quantities of pottery and stone mortars for food preparation suggest that Đa Bút and Quỳnh Văn communities were less mobile than their predecessors. However, their economies still focused on hunting a variety of terrestrial game, fishing in rivers, estuaries and along

the coast, and the collection of plants and molluscs. There is no evidence that they cultivated crops or managed animal populations. There are old reports of domestic dog and cattle from Đa Bút (Patte 1932; Vũ, T.L. 1979) and Cồn Cổ Ngựa (dog only, Bùi, V. 1991), but neither has been substantiated through comparative zooarchaeological research. Scott et al. (2019) have recently argued that high ratios of arm, leg and spine trauma observed in the human burial population from Cồn Cổ Ngựa, in combination with a predominance of bovine remains in the archaeological record, could potentially reflect early stages of buffalo herding or even management. A predominance of bovines has also been recorded at Dingsishan in Guangxi, and earlier in the Terminal Pleistocene at Laang Spean in Cambodia. Perhaps a more likely scenario for the observed incidences of trauma would be close encounter hunting, as also suggested by Scott et al. (2019).

FIGURE 4 HERE

The Arrival of the Neolithic in Vietnam

Neolithic food production in East and Southeast Asia had its origins in the Yellow and Yangzi basins, and involved the development of sedentary agricultural village life in association with intensive population growth (Bellwood 2005, 2013; 2017). By 6500 BC, people were growing millet of the common (or broomcorn) and foxtail varieties along the edge of the Yellow River Valley (Stevens et al. 2016), and short-grained rice of the annual subspecies *Oryza sativa japonica* in small flooded paddy fields around the edge of the Yangzi Basin (Zheng et al. 2016; Yao et al. 2016). They also raised pigs and dogs, the latter kept both as companions as well as for food. Demographic expansion is recognized through rapidly increasing site numbers in central China, as agriculturalists began to spread south to establish new settlements (Bellwood and Oxenham 2008). Phytoliths claimed to be from domesticated *Oryza sativa* date from *c.* 3500 BC in a sediment core on Hainan Island (Wu et al. 2016), and C14 dates on charred rice remains suggest an arrival of domesticated rice in Guangdong by *c*. 3000 BC (Yang et al. 2016). Foxtail millet has been identified along with rice at Gantuoyan in Guangxi, close to the border with northern Vietnam, by *c*. 3000 BC, suggesting that this crop also travelled with early agricultural communities as they spread into southern China (Castillo and Fuller 2010).

Many of the oldest agricultural settlements in southern China and northern Vietnam appear to have been established along rivers, which provided useful water supplies for crop production, reliable aquatic resources, and modes of transport and communication. The Red River Valley provided direct access from Yunnan into northern Vietnam. The Mekong meanders from Laos along the borders between Thailand and Cambodia, and into southern Vietnam. Central Vietnam, however, lacks major rivers, and movement here was probably oriented along the coastline.

As recently as 2500 BC, a high postglacial sea level still covered both the Red and Mekong deltas. Since then the sea level has dropped slightly, and increasing rates of alluvial deposition associated with forest clearance and farming have in-filled the

former bays with sediment, thus forming the Red and Mekong deltas that exist today. Thus, when Neolithic populations arrived in Vietnam, close to 2000 BC, they were obliged to dwell on the fairly narrow Pleistocene alluvial terraces that fringed these nascent and still saline deltas. As a result, Neolithic sites occur in Ninh Bình and Thanh Hóa provinces south of the Red River delta, in the Red River valley itself upstream from Hanoi, and to the north of Hải Phòng and on Cát Bà Island (Nishimura 2005; Funabiki et al. 2012). None exist in the recently-formed and low-lying central deltaic regions.

Likewise, in the lower Mekong region, Neolithic populations occupied the separate valleys that meander immediately north of the major Mekong distributaries; in particular, those drained by the Vàm Cỏ Đông, Vàm Cỏ Tây, Đồng Nai and Sài Gòn rivers (Bellwood 2015; Bellwood et al. 2013; Nishimura 2002; Nguyễn, V.L. et al. 2000; Proske et al. 2010, 2011; Reinecke 2012; Ta, T.K.O. et al. 2002). However, these deltaic formation processes did not affect the long curving coastline of central Vietnam, where Neolithic sites occur on old dune alignments immediately inland from the modern active sand dunes.

The Greater Red River Region, Northern Vietnam:

The earliest known Neolithic assemblages of the lower Red River basin are associated with the Phùng Nguyên culture, a poorly-dated concept but one which probably commenced around 2000 BC. Phùng Nguyên settlements are concentrated upriver in Phú Thọ and Vĩnh Phúc provinces, and close to Hà Nội. Sites are mostly open air and large enough to have functioned as sedentary settlements, although rigorous analysis of Neolithic settlement structures in northern Vietnam is so far lacking. The settlements were generally located on low undulating landscapes and close to rivers.

The Phùng Nguyên culture records a number of major cultural changes from the preceding Đa Bút and Quỳnh Văn. Lithic assemblages are now dominated by ground stone tools, and any excavated stone flakes usually have tell-tale polished surfaces indicating that they were struck from ground tools during use or resharpening (Figure 3). The flaked pebble tools that were so important in the Hoabinhian only occur in very small quantities. There were also some very major changes in the way people interred their dead. This is exemplified by the 85 burials recorded from Mán Bạc in north central Vietnam, dating to 1900–1600 BC. These were extended and mostly supine, or sometimes flexed on their sides, but not squatting or tightly contorted like the earlier Dabutian and Quỳnh Văn burials (Figure 4; Oxenham et al. 2011). Unlike the pre-Neolithic burials, that rarely possess grave goods, individuals at Mán Bạc were interred with a wealth of pottery and personal ornamentation.

Another interesting feature of the Mán Bạc cemetery is that it contains a predominance of individuals of East Asian Neolithic phenotype, but with a lesser proportion of people with an Australo-Papuan craniofacial morphology similar to that of the earlier Cồn Cổ Ngựa and Đa Bút populations, and pre-Neolithic burials in southern China (see Oxenham et al. this volume; Matsumura et al. 2008; Matsumura et al. 2019). Both groups were buried together at Mán Bạc with similar types of

pottery, bracelets and beads as grave goods, and in the normal extended and supine Neolithic fashion. It is therefore possible that members of indigenous Southeast Asian populations were at this time being integrated into immigrant Neolithic communities originating from the north. Ancient mitochondrial DNA recovered from a few of the Mán Bạc skeletons confirms this reconstruction, since some of the haplogroups identified were of central Chinese origin, whilst others were of native Southeast Asian affinity (Shinoda 2011).

Phùng Nguyên Neolithic sites also have some clear parallels with slightly earlier and contemporaneous settlement sites in Guangxi and Guangdong, and further to the north in central China. For example, numerous pits containing dark sediments have been identified in Phùng Nguyên sites similar to those identified by Chinese archaeologists as ponds, wells, sacrificial pits and/or small paddy fields (Liu et al. 2000). In Hong Kong, carved-paddle and cord-impressed globular pots very comparable to those placed in the Mán Bạc burials (Nguyễn, K.D. et al. 2011) occur in Neolithic assemblage F at Sham Wan on Lamma Island (Tsui and Meacham 1978), and at Sha Ha in the New Territories (AMO 2005), both dating to 2000 BC or before. Both of these Hong Kong sites have also produced polished projectile points and small untanged stone adzes very similar to those found in Phùng Nguyên contexts (Figures 2 and 3). However, Sham Wan and Sha Ha also have many shouldered and stepped adzes, the former common in many other parts of central and southern Vietnam, but not in the Phùng Nguyên itself. Some of these differences may reflect locally specific contacts and exchange networks.

Xóm Rền in Phú Thọ Province and the eponymous site of Phùng Nguyên itself have also produced some remarkable examples of nephrite blades, termed *zhang* by Chinese archaeologists (Hán, V.K. 2009: 85; Figure 3). These have been found in almost identical form in Erlitou and Shang period sites in central China, and especially in the "sacrificial" offering pits at Sanxingdui in Sichuan Province, dated by Chinese archaeologists to about 1300 BC (Liu et al. 2000). However, many of the Phùng Nguyên nephrite objects were manufactured locally in Vietnam, as indicated by the discovery of a workshop for making bracelets and beads at Tràng Kênh near Hải Phòng (Nguyen, K.D. 1996). The nephrite was worked with stone drills and cutters that were probably lubricated by plentiful hard and sharp quartz sand and water. Beads and bracelets of a nephrite still not sourced with precision were buried with some of the dead at Mán Bạc.

Sporadic occurrences of rice exist as carbonized grain or husk in some Phùng Nguyên sites (Nguyễn, X.H. 1998), and plentiful *japonica* rice phytoliths have been identified by Japanese agricultural scientist Tetsuro Udatsu in the occupation layers immediately above the burials at Mán Bạc. Since Mán Bạc is located in a coastal mudflat dominated by mangrove swamp forest we cannot be sure that the rice was actually grown there, but it was certainly consumed in some form. Mán Bạc otherwise had an economy focusing on the capture of riverine or estuarine fish, hunting, and the keeping of domesticated pigs and dogs (Sawada et al. 2011; Jones et al. in press).

Most of the 14 radiocarbon samples so far dated place the Phùng Nguyên and Tràng Kênh cultures in the early to middle 2nd millennium BC (Nguyen, K.D. 1996;

Hán, V.K. 2009; Nguyễn, Q.M. 2014; Matsumura and Oxenham 2011; Jones et al. in press). By *c.* 1500–1000 BC, settlements belonging to the Đồng Đậu Culture, successor to the Phùng Nguyên, appeared on broad river terraces in northern Vietnam (Nguyễn, Q.M. 2005). At the sites of Đồng Đậu A itself, and Thành Dền, the large quantities of charred rice grains and chaff recovered are a clear indication that intensive agriculture was now underway. The inhabitants of these settlements also maintained populations of domestic pigs and dogs, and possibly buffalo (Lâm, T.M.D. 2016).

In the mountainous regions of northern Vietnam, the Neolithic record consists of the Hà Giang and Mai Pha cultures. Sites such as Lò Gạch are distributed along the Chảy, Gâm and Lô Rivers in Hà Giang Province. These sites have produced shouldered adzes and axes and bracelets with D- and T-shaped profiles, and bark cloth beaters. Pottery is rare, but consists of coarse thick-walled vessels sometimes with ring feet. Although undated, the Hà Giang culture supposedly dates to 3000–2000 BC (Nguyễn, K.S. et al. 2004).

In excess of 20 Mai Pha sites have been identified in Lạng Sơn Province, possibly dating to the early 2nd millennium BC. The material culture shows clear parallels with southern China and consists of quadrangular sectioned axes and adzes, knives, chisels and awls, and bark cloth beaters. The pottery is relatively finely manufactured with thin walls and sometimes a red-slip, some with tall pedestals and incised decoration (Hà, V.T. (ed) 1998: 253, 263-264; Nguyễn, K.S. et al. 2004). The zooarchaeological evidence suggests that Mai Pha communities hunted and fished, collected wild plants, and maintained populations of domestic pigs, dogs and buffalo (Hà, V.T. (ed) 1998: 253, 263-264).

South of the Red River – Central Vietnam

Vietnamese archaeologists recognize a large number of regional variants on a basic Neolithic theme in north and central Vietnam that are considered to be contemporaneous with, or slightly later than, Phùng Nguyên. They date roughly into the second millennium BC, although most sites remain poorly dated, or undated. These include the Bàu Tró, Hạ Long, Đầu Rằm, Hoa Lộc, Biển Hồ, Lung Leng and Buôn Triết cultures to the south of the Red River, and Tràng Kênh to the north (Nguyễn, K.S. 2007; Nguyễn, K.S. et al. 2004). Although archaeologists consider these settlement sites to have been inhabited by agriculturalists, there has been little systematic palaeobotanical and zooarchaeological research undertaken on the plant and animal remains, and the principle subsistence strategies remain enigmatic. However, the results of pollen analysis from Tràng Kênh have hinted at possible rice cultivation (Hán, V.K. 2005: 166).

Thạch Lạc in Hà Tĩnh Province has produced a deep archaeological sequence of pre-Neolithic and Neolithic settlement activity. The site is now approximately 4 km from the modern coastline, but was probably situated on a back-beach when it was initially occupied during the Quỳnh Văn period around 3200–2900 cal. BC. Following a short hiatus, the site was re-occupied during the Thạch Lạc cultural phase. The inhabitants produced the typical dark cord-marked pottery of this culture

with rounded bases and ring feet, and they possessed shouldered adzes. A series of dates on charcoal and bone indicate that this phase dates to *c.* 2900–2650 cal. BC.

Succeeding another period of inactivity, the site was again inhabited, this time by communities belonging to Bàu Tró Culture. Some Vietnamese archaeologists consider Bàu Tró to be a predecessor to the Đồng Đậu culture. Bàu Tró sites contain red-fired pottery with intricate incised designs, and they utilized quadrangular unshouldered and shouldered adzes. The dates for this period at Thạch Lạc suggest occupation around *c.* 2480–2200 cal. BC.

The recently acquired radiocarbon dates for the Thạch Lạc and Bàu Tró cultures at Thạch Lạc are several centuries older than expected. They suggest that further assessment of the late pre-Neolithic and Neolithic chronology of northern and central Vietnam is required to determine the relationships between the different cultures identified across the regions. The dates are also several centuries older than relatively well-dated Phùng Nguyên sites in northern Vietnam, and make us wonder if the Vietnam Neolithic appeared first along the north-central coast, facing the large southern Chinese island of Hainan, although at present this is just speculation. On-going palaeobotanical and zooarchaeological research will also be required to determine whether the inhabitants of Thạch Lạc during the Bàu Tró and "pre-Đồng Đậu" phases of occupation were primarily foragers or farmers.

The Greater Mekong Delta: An Sơn and the Neolithic of Southern Vietnam:

Numerous mounded open-air Neolithic settlement sites have been recorded along the banks of the Vàm Cỏ Đông River, commencing around 2200 BC. These include Lộc Giang and An Sơn in Long An Province (Bellwood et al. 2013; Piper et al. 2017), and Dinh Ông in Tây Ninh Province. They also occur slightly later, from around 1600 BC onwards, along the coast at Rạch Núi, Gò Cá Sỏi and Gò Cây Me, and on the Đồng Nai and Bé Rivers where the settlements and lithic workshops of Cù Lao Rùa, Mỹ Lộc Hàng Ông Đại, Hàng Ông Đụng, Suối Linh and Đa Kai have been recorded. Recent investigations have also identified large circular earthworks, such as An Phú, Long Hưng 1, Lộc Quang 2 and Thuận Lợi 3 in Lộc Ninh, Bình Long, Đồng Phú and Phước Long districts, as Neolithic in date.

An Sơn is a 5 m high mound that consists of habitation layers and floors of alluvial silt loam laid consecutively between *c.* 2200 and 1500 BC (Nishimura and Nguyễn, K.D. 2002; Bellwood et al. 2013). As the settlement expanded both upwards and outwards, new floors and habitation layers were constructed on top of earlier refuse deposits, and eventually extended to cover burials that had initially been deposited around the periphery of the settlement.

When first established, An Sơn was probably already some distance from the coast, although the molluscan fauna would indicate that the Vàm Cỏ Đông environment here consisted of tidal mangrove and *nipah* palm swamp forest. Estuarine fish such as snakehead and catfish appear to have contributed significantly to the protein diet, as well as domestic pigs and dogs and a variety of other aquatic and terrestrial vertebrate species (Bellwood et al. 2013; Piper et al. 2014). Rice phytoliths also occur in the soil layers down to the base of the site, which was

founded on a raised alluvial terrace above the modern flood plain and close to good rice growing soils. According to analyses by the late Alison Weisskopf at the Institute of Archaeology in London, phytoliths indicate that the rice was both processed and consumed at An Sơn. Thus, like the Phùng Nguyên peoples to the north, these Neolithic populations of southern Vietnam were food producers.

A great deal of the An Sơn pottery is organic tempered, often with rice husks, although not apparently in the basal 20 cm of the site. This suggests that the habit of mixing rice chaff as temper in pottery might have been innovated in southern Vietnam and Thailand after the Neolithic began. The rice found in the An Sơn pottery has been identified as subspecies *Oryza sativa japonica* from chloroplast DNA markers by Katsunori Tanaka (Cobo Castillo et al. 2016). This makes an ultimate origin in the Yangtze region very likely, since the Yangtze is now well established as the homeland for rice cultivation and domestication in eastern Asia.

The An Sơn burials, all of a mainly East Asian craniofacial morphology, were extended and supine. The pottery included in the burials was normally paddle-impressed, with cord marking and surface combing being more common than the carved paddle impression that was typical at Mán Bạc (Figure 2). As with Mán Bạc, however, the finest vessels were elaborately decorated with horizontal incised patterns filled with stamping, but here with less interest in curvilinear motifs than in Phùng Nguyên contexts. Many were placed on elaborate pedestals, richly decorated around their bases (Bellwood et al. 2013; Bellwood 2015). Similar pottery has been recovered from the nearby contemporary site of Lộc Giang, excavated in 2014 (Piper et al. 2017). There is also an unusual type of open bowl with a wavy or serrated rim, a vessel shape unique to An Sơn and Lộc Giang, that only occurs in early phases of site occupation, before *c*. 1500 BC (Nishimura and Nguyễn, K.D. 2002; Piper et al. 2017).

Rạch Núi is another mounded settlement site some 80 km south of An Sơn and Lộc Giang, located near the confluence of the Vàm Cỏ Đông and Vàm Cỏ Tây Rivers. The settlement was established around 1500 BC, shortly after the sea levels receded and the land emerged. It consists of a 5m high mound that developed through the continuous reconstruction of successive dwellings and surfaces over a period of about 150–200 years. The 2012 excavations demonstrated that the site had been deliberately planned from its inception. Structures were built on slightly raised platforms on a north-south alignment, surrounded by deliberately laid surfaces with foundations of pottery sherds mixed with sediment and possibly lime mortar, as was also observed at the older site of Lộc Giang. Sometime during the occupation of Rạch Núi, a number of small rectangular (presumably timber) structures with clay floors were built to the north, aligned with the larger platforms (Oxenham et al 2015; Piper and Oxenham 2014).

The inhabitants of Rạch Núi were heavily engaged in the production of huge quantities of coarse bag-shaped cord-marked pottery, produced with little attention to shape or decoration (Figure 2). This resembles the much older pottery of the Pre-Neolithic site of Cồn Cổ Ngựa in Thanh Hóa Province, far to the north, although it is unclear whether this represents a meaningful cultural continuity or is simply due to chance. Freshwater storage in this saline mangrove habitat might have been one

function of this mass-produced pottery, or perhaps the production and storage of a marinated fish-based product, or something of that kind, for trade. They also collected a variety of plants and estuarine shellfish and captured large river terrapins, crocodiles and monkeys. However, their protein came predominantly from fish captured in the river channels close to the settlement. Although hunting, fishing and collecting were the main foci of subsistence, the Rạch Núi community also maintained populations of domestic pigs and dogs. The macrobotanical and phytolith evidence indicates that they had access to rice and millet but it is unlikely that these crops could have been grown in the brackish water soil conditions around Rạch Núi, so it is possible that they were traded in (Oxenham et al 2015; Cobo Castillo et al. 2018).

Preliminary assessment of two sites located in the lowland tidal zone in Bà Rịa - Vũng Tàu Province, at Gò Cá Sỏi and Gò Cây Me, have shown that they possess similar floor surfaces and pottery forms to Rạch Núi, implying that these lowland coastal populations might have been distributed more broadly in the swamp forests of southern Vietnam.

There is very little evidence for any significant social, cultural or exchange connections between Rạch Núi and the settlements of An Sơn and Lộc Giang, except for the presence of a few sherds of Rạch Núi type pottery in the upper layers of these two sites. In contrast, there is strong stylistic evidence in a small quantity of finely decorated pottery at Rạch Núi for contact with settlement sites along the Đồng Nai River and its tributaries, such as Đa Kai (Nishimura et al. 2009). The relatively small amounts of this finely decorated pottery, compared to the vast quantities of locally produced poor quality pottery, suggests that the former was exchanged in from settlement sites to the north.

Stone suitable for the manufacture of lithic implements, such as the shouldered and unshouldered quadrangular-sectioned adzes found at An Sơn, Lộc Giang and Rạch Núi, is completely absent from the lowland riverine regions of southern Vietnam. It is still unclear where the stone sources for the adzes and axes found in abundance at Vàm Cỏ Đông sites were located, but the Rạch Núi stone adzes can probably be traced to workshops in the upper Đồng Nai Basin, such as Hàng Ông Đại, Hàng Ông Đụng and Suối Linh on the Bé River, about 80–100 km in a straight line to the northeast of Rạch Núi (Frieman et al. 2017).

At these workshops, hundreds of broken and unfinished shouldered and unshouldered adzes, axes, hoes, picks and chisels have been recovered (terminology following Bùi, C.H. et al. 2017). The quarrying and initial stone implement preparation appears to have been undertaken by people residing in settlements downstream, such as Cù Lao Rùa, Mỹ Lộc and Bình Đa. The discovery of almost 1000 complete and fragmented grinding stones at Mỹ Lộc suggests that the grinding, shaping and finishing of the preforms from the quarries might have taken place within the settlements themselves (Bùi, C.H. et al. 2014).

Another type of archaeological site that has been identified along the Vietnamese-Cambodian border comprises the circular earthworks located in the basaltic plateau region of Bình Phước. Since 2010, some 46 of these sites have been discovered, usually distributed in clusters approximately 10–15 km apart. The

majority of these sites are located on hilltops overlooking narrow plains or valleys, with water sources close by. In plan they are usually circular with an internal ditch, external bank, and one or two entrances (Bùi, C.H. et al. 2017). Excavations have demonstrated the presence of numerous postholes within the interiors and even in the ditches.

Cultural remains from these circular earthworks include implements and weapons manufactured from stone transmitted through the lithic workshops of Hàng Ông Đại and Hàng Ông Đụng (Bùi, C.H. and Nguyễn, K.T.K. 2014a). The pottery and stone artefacts are similar to those recovered from other Đồng Nai sites, such as Bình Đa, Cù Lao Rùa and Mỹ Lộc (Bùi, C.H. et al. 2017). Four "ranging" dates on charcoal from the sites of An Phú, Long Hưng 1, Lộc Quang 2 and Thuận Lợi 3 all fall between 1800 and 1200 cal. BC, confirming the relative chronology established from pottery and stone tool similarities with the Neolithic sites on the Đồng Nai (Bùi and Nguyễn K.T.K. 2014b). The extremely aggressive acidic nature of the soil in these sites has unfortunately obliterated all organic remains, and at present it is difficult to determine details of subsistence. No Bronze or Iron Age activity has so far been recorded at any circular earthworks in Vietnam where test excavations have been conducted.

Origins and Development of the Neolithic in Vietnam

At present, the earliest recorded arrival of Neolithic populations in Vietnam remains somewhat enigmatic. Recent archaeological research along the coastal plains of north-central Vietnam have demonstrated that the Thạch Lạc and Bàu Tró cultures potentially date to the middle (*c.* 2800 cal. BC) and later (*c.* 2400 cal. BC) 3rd millennium BC, respectively, and are older than the Phùng Nguyên and Tràng Kênh settlements of the Red River region further north. Further research is required, especially in terms of the economic strategies of the Thạch Lạc and Bàu Tró cultures.

To date, most comparisons between Vietnam and southern China have concentrated on regions of mainland southern China that lie directly to the north, such as Guangxi and Guangdong. But the coast of central Vietnam also faces the large southern Chinese island of Hainan, from which it is separated by a minimum sea distance of around 200 kilometres. Given that sea-borne Neolithic colonisations of Taiwan and the Philippines from ultimate sources in southern China were occurring side by side with the spread of the Neolithic in Vietnam, a potential role for Hainan must be taken into account.

The initial arrival of Neolithic populations beyond the north-central coastal fringes have been dated to *c.* 1900 cal. BC at sites such as Mán Bạc and Phùng Nguyên in northern Vietnam, and An Sơn and Lộc Giang in the south. These communities, primarily of East Asian origin, appear to have spread rice and millet agriculture and the management of pig and dog populations through large areas of southern China and into Southeast Asia. In northern and central Vietnam, immigrant farming populations encountered pre-existing semi-sedentary foraging communities of Southeast Asian descent and Australo-Papuan craniofacial morphology, inhabiting lowland plains and coastal regions. These indigenous groups hunted a diversity of

game, fished, collected molluscs and possibly managed a variety of plants for various economic, cultural and social purposes. Such populations presumably also inhabited southern Vietnam, but no Holocene pre-Neolithic sites have yet been investigated there.

Considerable differences between the pre-Neolithic and Neolithic cultures are manifest in the types, form and decoration of the pottery they produced, the lithic technologies they manufactured and utilized, and the varieties of ornamentation they adorned themselves with. Strong dissimilarities in culture and ideology are clearly evident in the different burial practices of the late forager populations belonging to the Đa Bút and Quỳnh Văn cultures and the succeeding Neolithic. Late forager populations usually buried their dead without grave goods, sometimes mutilated, and in a variety of flexed and seated positions. Conversely, the early agriculturalists of Mán Bạc and An Sơn were generally placed in a fully extended position with pottery and ornaments as grave goods. Contact and overlap between foragers and farmers is recorded craniofacially and genetically at Mán Bạc, where several individuals of Australo-Papuan heritage have been identified within a cemetery containing a majority of people of East Asian origin. The uniformity in the supine mode of burial and the Neolithic material culture in the Mán Bạc cemetery imply an integration of former foragers into the more numerous East Asian farming populations.

Ancestral ties between the occupants of An Sơn and Lộc Giang along the Vàm Cỏ Đông River and those of the northern Vietnam Neolithic and southern China can be discerned through the similar modes of pottery decoration, especially the favouring of zones or motifs created from rows of punctate stamps, often filling spaces within incised borders. An Sơn, Mán Bạc and Xóm Rền all share aspects of this kind of decoration (Rispoli 2007).

However, details in design and motif, differences appear. For example, An Sơn rouletted pottery decoration, in particular, is different from Mán Bạc pottery decoration, but is similar to that on pottery from the contemporary site of Ban Non Wat in northeastern Thailand (Sarjeant 2014), suggesting stronger connections for southern Vietnam up and down the Mekong River and its tributaries than with the Red River.

Other material culture also demonstrates some marked variation. Shouldered adzes and projectile points, turtle bone fishhooks and the use of rice chaff temper in pottery are all present at An Sơn and Lộc Giang, but rare to absent in the north at Mán Bạc. Conversely, stone bark cloth beaters, baked clay pottery anvils, and nephrite beads and bracelets (with T-shaped cross-sections) are found at Mán Bạc and Xóm Rền, but not An Sơn. This would imply that some aspects of shared cultural and social identity endured for a period, but that little if any contact over the *c*. 1500 km between North and South Vietnam continued once populations had dispersed across the region. Furthermore, in southern Vietnam we observe local traditions emerging by at least *c*. 1500 BC, especially with the establishment of specialized manufacturing workshops and production centres. The absence or scarcity of any of the distinctive pottery types and other material culture recorded further inland, at An Sơn, Lộc Giang and Dinh Ông on the Vàm Cỏ Đông River, and in the Đồng Nai and coastal sites,

suggests that these communities were situated within different spheres of social, cultural (and presumably ideological) interaction.

Even subsistence strategies appear to have varied depending on settlement location, social and economic strategies, and perhaps site function. At An Sơn, for instance, the presence of rice, pigs and dogs suggests that the economy was primarily based on agriculture, but with fishing, foraging and management of forests as substantial contributors. In contrast, the inhabitants of Rạch Núi in the tidal swamp forests of the Mekong are unlikely to have grown crops or kept considerable numbers of domestic animals, although pigs and dogs were present. At Rạch Núi, rice and millet were probably imported from elsewhere. The strong reliance on aquatic resources and wild plants and animals is reflected in the animal bone and plant assemblages (Cobo Castillo et al. 2018; Oxenham et al. 2015).

Thus, the developing synthesis between the results of research in archaeology, skeletal biology and genetics suggests that the centuries around the mid to late 3rd millennium BC witnessed some remarkable cultural and biological changes in Vietnam, and Southeast Asia as a whole. Neolithic populations with food production based on rice, millet, pigs and dogs spread south from southern China into Mainland Southeast Asia, constructing sedentary settlements along rivers and on the coast. Descendant communities later diverged socially and culturally, establishing their own local traditions of design in pottery, material culture, manufacturing and subsistence, society and identity. It could be argued that it was during the Neolithic that we observe the early stages of social and cultural diversification that underpinned the emergence of stratified societies in the later Bronze Age and Iron Age of Southeast Asia.

ACKNOWLEDGEMENTS

Peter Bellwood and Philip Piper were funded through the ARC Discovery Grant DP140100384.

Radiocarbon determinations from Rú Điệp and Thạch Lạc were undertaken with a research grant from the Marsden Fund to Charles Higham.

Special thanks to Trần Thị Kim Quý who spent considerable time correcting the diacritic script in the manuscript.

REFERENCES

AMO. 2005. *The Ancient Culture of Hong Kong: Archaeological Discoveries in Sha Ha, Sai Kung*. Hong Kong.

Bellwood, P. 2005. *First Farmers: The Origins of Agricultural Societies*. Oxford: Blackwell Publishing.

Bellwood, P. 2013. *First Migrants*. Boston and Oxford: Wiley Blackwell.

Bellwood, P. 2015. Vị trí của Việt Nam trong tiền sử Đông Á –một hướng tiếp cận đa ngành về thời đại đồ đá mới [Vietnam's place in the prehistory of Eastern Asia – a multidisciplinary perspective on the Neolithic] In A. Reinecke ed., *Perspectives on the Archaeology of Vietnam*, pp. 47-70. German Archaeological Institute.

Bellwood, P. 2017. *First Islanders* (Malden: Wiley Blackwell).

Bellwood, P and M. Oxenham. 2008. The expansions of farming societies and the role of the Neolithic Demographic Transition. In: J.-P. Bocquet-Appel and O. Bar-Yosef (eds.) The Neolithic Demographic Transition and its Consequences. Dordrecht, 13-34.

Bellwood, P., M. Oxenham, C.H. Bùi, K.D. Nguyễn, A. Willis, C. Sarjeant, P.J. Piper, H. Matsumura, K. Tanaka, N. Beavan, T. Higham, M.Q. Nguyen, K.N. Dang, K.T.K. Nguyễn, T.H. Võ, N.B. Văn, T.K.Q. Trần, P.T. Nguyễn, F. Campos, Y-I. Sato, L.C. Nguyễn and N. Amano. 2013. An Sơn and the Neolithic of southern Vietnam. *Asian Perspectives* 50, 2011: 144-75.

Bùi, V. 1991 The Đa Bút Culture in the Stone Age of Vietnam. *Bulletin of the Indo-Pacific Prehistory Association* 10:127-131.

Bùi C.H. and Nguyễn K.T.K. 2014a. Di tích đất đắp dạng tròn ở Bình Phước: quá trình phát hiện và những nhận thức mới. Tạp chí Khoa học Xã hội, số [Circular earthwork sites in Binh Phuoc: new discovery and insight. *Review of Social Science*] 10(194): 90-99

Bùi C.H. and Nguyễn K.T.K. 2014b. Di tích đất đắp dạng tròn : giá trị văn hóa – lịch sử và giải pháp bảo tồn. Tạp chí Khoa học Xã hội [Circular earthworks archaeological sites: historical-cultural values and solutions for their preservation. *Review of Social Sciences*] 11 (195): 67-75

Bùi, C.H., Nguyễn, K.T.K and Đặng, N.K . 2017. Khảo cổ học Nam Bộ thời tiền sử. Hanoi: *Khoa học Xã hội* [Archaeology of Nam Bo (Prehistory)] (English summary by P.J. Piper).

Castillo, C. and D.Q. Fuller. 2010. Still too fragmentary and dependent upon chance? advances in the study of early Southeast Asian archaeobotany, in B. Bellina, E.A. Bacus, T.O. Pryce and J.W. Christie (eds). *50 Years of Archaeology in Southeast Asia: Essays in Honour of Ian Glover*, Bangkok: River Books: 91-111.

Cobo Castillo, C., K. Tanaka, Y-I. Sato, R. Ishikawa, B. Bellina, C. Higham, N. Chang, R. Mohanty, M. Kajale and D.Q. Fuller. 2016. Archaeogenetic study of prehistoric rice remains from Thailand and India: evidence of early *japonica* in South and Southeast Asia. *Archaeological and Anthropological Sciences* 8(3): 523-543.

Cobo Castillo, C. D.Q. Fuller, P.J. Piper, P. Bellwood and M. Oxenham. 2018. Hunter-gatherer specialization in the Late Neolithic of southern Vietnam – the case of Rạch Núi, *Quaternary International* 489: 63-79.

Frieman, C., P.J. Piper, Nguyễn, K.T.K, Trần, T.K.Q and M. Oxenham. 2017. Ground stone technology in coastal Neolithic settlements of southern Vietnam: grinding stones and adzes from Rạch Núi, *Antiquity* 91(358): 933-946.

Funabiki A., S. Yoshiki, Vũ, P.V., Nguyễn, H. and S. Haruyama. 2012. Natural levees and human settlement in the Sông Hồng (Red River) delta, northern Vietnam. *The Holocene* 22:637-48.

Hán V.K. 2009, *Xóm Rền Một di tích KCH đặc biệt quan trọng của thời đại đồ đồng Việt Nam*, Nxb ĐHQG, Hà Nội [Xóm Rền – A most important site of the Vietnamese Bronze Age, Hanoi: VNU Publishers]

Hà V.T. (ed.,) 1998, *Khảo cổ học Việt Nam, T.I. Thời đại Đồ đá, Nxb KHXH, Hà Nội* [The Stone Age, Vietnamese Archaeology 1 Hanoi: Social Sciences Publishers].

Jones, R.K., Piper, P.J., Wood, R., Nguyen, A.T. and Oxenham, M.F. in press. The Neolithic transition in Vietnam: Assessing evidence for early pig management and domesticated dog, *Journal of Archaeological Science: Scientific Reports*.

Jones, R., P.J. Piper, C. Groves, Tuấn Nguyễn Anh, Mai Huong Nguyễn Thi, Hảo Nguyễn Thị, Trinh Hiep Hoang and M. Oxenham 2019. Shifting subsistence patterns from the Terminal Pleistocene to Late Holocene: A regional Southeast Asian analysis, *Quaternary International*, https://doi.org/10.1016/j.quaint.2019.01.006

Lâm M.T.D. (editor) 2016, Địa điểm khảo cổ học Thành Dền – Những giá trị lịch sử-văn hoá nổi bật, Nxb ĐHQG, Hà Nội [Thành Dền Archaeological Site – the Most Important Historic/Cultural Achievements, Hanoi: VNU Publishers].

Lam, T.M.D, T.T. Nguyen, Tran T.K.Q, P. Bellwood, C. Higham, F. Petchey, E. Grono, C. Nguyen and P.J. Piper in review. Rú Điệp and the Quỳnh Văn Culture of Central Vietnam, *Archaeological Research in Asia*

Li, F-J., M-H. Wang, X-G. Fu, K. Dobney, Z. Li, B-Y. Chen and C. Yu. 2013. Dismembered Neolithic burials at the Ding Shi Shan site in Guangxi, southern China. *Antiquity* 87(337): http://antiquity.ac.uk/projgall/fu337/

Liu Y. and E. Capon. 2000. *Masks of Mystery: Ancient Chinese Bronzes from Sanxingdui*. Sydney.

Lu, P. 2010 Zooarchaeological Study on the Shell Middens in the Yong Valley of Guangxi. Unpublished Ph.D Dissertation. Beijing: Institute of Archaeology, of Chinese Academy of Social Sciences (in Chinese).

Matsumura, H., Oxenham, M.F., 2011. Introduction: Man Bac biological research objectives, in M.F. Oxenham, H. Matsumura and K.D. Nguyen (Eds.), Man Bac: the excavations of a Neolithic site in northern Vietbam: ANU Press: Canberra: 1-8.

Matsumura, H. and M. Oxenham. 2014. Demographic transitions and migration in prehistoric East/Southeast Asia through the lens of non-metric dental traits. *American Journal of Physical Anthropology* 155:45-65.

Matsumura, H., Hung, H-c., Higham, C., Zhang, C., Yamagata, M., Nguyen, L.C., Li, Z., Fan, X-c., Simanjuntak, T., Oktaviana, A.A., He, J-n., Chen, C-y., Pan, C-k., He, G., Sun, G-p., Huang, W-j., Li, X-w., Wei, X-t., Domett, K., Halcrow, S., Nguyen, K.D., Trinh, H.H., Bui, C.H., Nguyen, K.T.K. and Reineke, A., 2019. Craniometrics reveal 'two layers' of prehistoric human dispersal in Eastern Eurasia. *Nature: Scientific Reports* 9:1451 DOI:10.1038/s41598-018-35426-z

Matsumura, H., Hung, H-c, Zhen, L. and Shinoda, K. 2017. Bio-anthropological studies of Early Holocene hunter-gatherer sites at Huiyaotian and Liyupo in Guangxi, China, *National Museum of Nature and Science Monograph* No. 47.

Matsumura H., M. Oxenham, Y. Dodo, K. Domett, Nguyen, T.K., Nguyen, L.C., Nguyen, K.D., D. Huffer, and M. Yamagata. 2008. Morphometric affinity of the late Neolithic human remains from Mán Bạc, Ninh Binh Province, Vietnam. *Anthropological Science* 116: 135-48.

Matsumura, H., Y. Dodo, W. Takigawa, F. Saheki, M.F. Oxenham, Nguyen, L.C. and Nguyen, K.T. 2006. An early Holocene Hoabinhian human skeleton from Hang Cho Site in northern Vietnam: *Anthropological and archaeological study of the origin of Neolithic people in Mainland Southeast Asia*, Unpublished Report of Grant-in-Aid for International Scientific Research (2003~2005 No.15405018): 52-82.

Matsumura H., M. Oxenham, Y. Dodo, K. Domett, T.K. Nguyen, L.C. Nguyen, K.D. Nguyen, D. Huffer, and M. Yamagata. 2008. Morphometric affinity of the late Neolithic human remains from Mán Bạc, Ninh Binh Province, Vietnam. *Anthropological Science* 116: 135-48.

Nguyễn, K.D. 1996. The Tràng Kênh jewellery workshop site. *Bulletin of the Indo-Pacific Prehistory Association* 14: 161-5.

Nguyễn K.S. 2007. Khảo cổ học thời đại đá Việt Nam. *Khảo cổ học Việt Nam* [Stone Age archaeology in Vietnam, *Vietnam Archaeology*] 2: 53-64.

Nguyễn K.S. 2013, Cave archaeology of Trang An the outstanding culture – historical values. *Vietnam Social Sciences*, N.1 (153): 53-67.

Nguyễn, K.S., Phạm, M.H., and Tống, T.T., 2004. Northern Vietnam from the Neolithic to the Han period, In P. Bellwood and I. Glover (Eds.) *Southeast Asia: from Prehistory to History*, London: Routledge Curzon: 177-208

Nguyễn, Q.M. 2005 Radiocarbon dating of the Đồng Đậu Period, *Bulletin of the Indo-Pacific Prehistory Association* 25(3): 113-116.

Nguyễn, Q.M. 2014, niên đại C14 và các giai đoạn phát triển của văn hoá Phùng Nguyên, *Khảo cổ học* số 3, Hà Nội [C14 dates and the chronological sequences of the Phùng Nguyên culture, *Archaeology Journal*, N.3, Hanoi]

Nguyễn, V.L., Tạ, T.K.O. and T. Masaaki 2000. Late Holocene depositional environments and coastal evolution of the Mekong Delta, southern Vietnam. *Journal of Asian Earth Sciences* 18: 427-39.

Nguyễn V. 2005. The Đa Bút Culture: evidence for cultural development in Vietnam during the middle Holocene. *Bulletin of the Indo-Pacific Prehistory Association* 25: 89-94.

Nguyễn X. H. 1998. Rice remains form various archaeological sites in North and South Vietnam. In: M. J. Klokke and T. de Bruijn (eds.) *South East Asian Archaeology 1996*, Centre for Southeast Asian Studies, University of Hull (UK): 27-40.

Nishimura, M. 2002. Chronology of the Neolithic age in southern Vietnam. *Journal of Southeast Asian Archaeology* 22: 25-57.

Nishimura M. 2005. Settlement patterns on the Red River plain from the late prehistoric period to the 10th century AD. *Bulletin of the Indo-Pacific Prehistory Association* 25: 99-108.

Nishimura M., Nguyễn, D.T. and Nguyễn, X.L. 2009. *The Excavation of Đa Kai: A Neolithic circular settlement site in the upper reach of the Đồng Nai River, southern Vietnam*. Southeast Asian Archaeology Data Monograph No. 1. Foundation to Safeguard the Underground Cultural Heritage in Southeast Asia, Yamaguchi, Japan.

Nishimura M. and Nguyễn, K.D. 2002. Excavation of An Sơn: a Neolithic mound site. *Bulletin of the Indo-Pacific Prehistory Association* 22: 101-9.

Oxenham, M., H. Matsumura and Nguyễn, K.D. (eds.) 2011. Mán Bạc: The Excavation of a Neolithic Site in Vietnam. *Terra Australis* 33, ANU E Press: Canberra.

Oxenham, M.F., P.J. Philip, P. Bellwood, Bùi, C.H., Nguyễn, K.T.K., Nguyễn, Q.M., F. Campos, C. Castillo, R. Wood, C. Sarjeant, N. Amano, A. Willis & J. Ceron. 2015. Emergence and diversification of the Neolithic of southern Vietnam: Insights from coastal Rạch Núi. *Journal of Island and Coastal Archaeology* 10(3): 309-338.

Oxenham, M.F., Trinh, H.H., A. Willis, R.K. Jones, K. Domett, C. Castillo, R. Wood, P. Bellwood, M. Tromp, A. Kells, P. Piper, Pham, S.T., H. Matsumura, H and H. Buckley, H. 2018. Between foraging and farming: strategic responses to the Holocene Thermal Maximum in Southeast Asia, *Antiquity* 92(364): 940-957.

Oxenham, M., A. Willis, Nguyễn, L.C. , and H. Matsumura *****. Hunter-gatherer mortuary variability in Vietnam

Patte, E. 1932 Le Kjokkenmodding neolithique de Đa Bút et ses sepultures. *Bulletin de la Société Géologique de l'Indochiné* 19(3):24-35.

Piper, P.J. and M.F. Oxenham, 2014. Of prehistoric pioneers: the establishment of the first sedentary settlements in the Mekong Delta region of southern Vietnam

during the period 2000-1500 cal. BC. In K. Boyle, R. Rabett, & C. Hunt (eds.) *Living in the Landscape: Essays in Honour of Graeme Barker.* (McDonald Institute Monographs) Cambridge: McDonald Institute for Archaeological Research: 209-226.

Piper, P.J., F.Z. Campos, Đặng, N.K.N. Amano, M. Oxenham, Bùi, C.H., P. Bellwood and A. Willis. 2014. Early evidence for pig and dog husbandry from the Neolithic site of An Sơn, Southern Vietnam, *International Journal of Osteoarchaeology*: 68-78.

Piper, P.J., Nguyễn, K.T.K., Trần, T.K.Q., R. Wood, C. Cobo Castillo, A. Weisskopf, F. Campos, Đặng, N.K. and P. Bellwood. in review. The Neolithic Settlement of Lộc Giang on the Vàm Cỏ Đông River and its Broader Regional Context. *Archaeological Research in Asia* 10: 32-47.

Proske, U., T. Hanebuth, H. Behling, Nguyễn, V.L., Tạ, T.K.O. and Bùi, P.D. 2010. The palaeoenvironmental development of the northeastern Vietnamese Mekong River Delta since the mid Holocene. *The Holocene* 20: 1257-68.

Proske, U., T. Hanebuth, J. Gröger and Bùi, P.D. 2011. Late Holocene sedimentary and environmental development of the northern Mekong River Delta, Vietnam. *Quaternary International* 230:57-66.

Reinecke, A. 2012. The prehistoric occupation and cultural characteristics of the Mekong Delta during the pre-Funan periods. In: M. L. Tjoa-Bonatz, A. Reinecke and D. Bonatz (eds.) *Crossing Borders*. Selected Papers from the 13th International Conference of the European Association of Southeast Asian Archaeologists, vol. 1. Singapore: 239-56.

Rispoli, F. 2007. The incised and impressed pottery of Mainland Southeast Asia: following the paths of Neolithization. *East and West* 57: 235-304.

Sarjeant, C. 2014. Contextualizing the Neolithic Occupation of Southern Vietnam. Canberra: ANU Press, *Terra Australis* 42.

Sawada J., Nguyễn, K.D. and Nguyễn, A.T. 2011. Faunal remains at Mán Bạc. In: M. Oxenham, H. Matsumura and Nguyễn, K.D. (eds.) Mán Bạc: The Excavation of a Neolithic Site in Vietnam, *Terra Australis* 33, ANU E Press, Canberra: 105-16.

Shinoda K. 2011. Mitochondrial DNA of human remains at Mán Bạc. In: M. Oxenham, H. Matsumura and Nguyen, K.D. (eds.) Mán Bạc: The Excavation of a Neolithic Site in Vietnam, *Terra Australis* 33, ANU E Press, Canberra: 95-104.

Stevens, C.J., C. Murphy, R. Roberts, L. Lucas, F. Silva and D.Q. Fuller. 2016. Between China and South Asia: A Middle Asian corridor of crop dispersal and agricultural innovation in the Bronze Age. *The Holocene* 26(10): 1541-1555.

Tạ T.K.O., Nguyễn, V.L., M. Tateishi, I. Kobayashi, S. Tanabe and S. Yoshiko 2002. Holocene delta evolution and sediment discharge of the Mekong River, southern Vietnam. *Quaternary Science Reviews* 21: 1807-19.

Tayles, N., S.E. Halcrow, T. Sayavongkhamdy and V. Soukasvatdy. 2015. A prehistoric flexed human burial from Pha Phen, Middle Mekong Valley: Its context in Southeast Asia, *Anthropological Science* 123(1): 1-12.

Trịnh, H.H. and D. Huffer 2015 The Đa Bút period in northern Vietnam: Current knowledge and future directions, *Journal of Indo-Pacific Archaeology* 35:36-47.

Tsui Y-c and W. Meacham. 1978. Pottery. In: W. Meacham (ed.), Sham Wan, Lamma Island, *Hong Kong Archaeological Society, Journal Monograph* 3, 127-82.

Vũ, T.L. 1979. Di tích động vật ở di chỉ Đa Bút (Thanh Hóa) trong đợt khai quật 1971. *Những Phát Hiện Mới về Khảo Cổ Học Năm* 1979: 54 [Faunal remains at Đa Bút (Thanh Hóa) in the 1971 excavation. *New archaeological discoveries of the year* 1979:54]

Wu, Y., L. Mao, C. Wang, J. Zhang and Z. Zhao. 2016. Phytolith evidence suggests early domesticated rice since 5600 cal a BP on Hainan Island of South China. *Quaternary International*. http://dx.doi.org/10.1016/j.quatint.2016.01.008.

Yang X., H. Barton, Z. Wan, Q. Li, Z. Ma, M. Li, D. Zhang and J. Wie. 2013. Sago-type palms were an important food plant prior to rice in southern subtropical China. *PLoS ONE* 8, e63148.

Yang, X., Zhuang, Y., Wang, W., Zhuang, Y., Li, Z., Ma, Z., Ma, Y., Cui, Y., Wei, J. and Fuller, D. 2016. New radiocarbon evidence on early rice consupption and farming in South China. *The Holocene* DOI: 10.1177/0959683616678465.

Yao, L., Y. Yang, Y. Sun, Q. Cui, J. Zhang and H. Wang. 2016. Early Neolithic human exploitation oand processing of plant foods in the Lower Yangtze River, China. *Quaternary International*. http://dx.doi.org/10.1016/j.quatint.2016.03.009.

Yoneda, M. 2006. AMS dating of human remain from Hang-Cho Site, Vietnam: *Anthropological and archaeological study of the origin of Neolithic people in Mainland Southeast Asia*, Unpublished Report of Grant-in-Aid for *International Scientific Research* (2003~2005 No.15405018): 48-51.

Zhang C. and H-c Hung. 2012. Late hunter-gatherers in southern China, 18,000-3000 BC. *Antiquity* 86: 11-29.

Zheng, Y., G.W. Crawford, L. Jiang and X. Chen. 2016. Rice domestication revealed by reduced shattering of archaeological rice from the Lower Yangtze valley. *Nature Reports* 6.28136/DOI:10.1038/srep28316.

LIST OF FIGURES

of very small nephrite disc beads; I, Mán Bạc stone bracelet segment, possibly nephrite, original diameter 4.5 cm.
Lower left: stone axe from Cồn Cổ Ngựa, 14 cm long.
Lower middle: turtle plastron shouldered axe from Rạch Núi, 9.3 cm long.
(Photographs by Peter Bellwood and Nguyễn Kim Dung)

Figure 4: Late forager and Neolithic burial traditions of Vietnam: Top: Squatting burial No.35 from Cồn Cổ Ngựa (photograph courtesy of Marc Oxenham); Middle: Fully extended burial MB07H2M19 from Mán Bạc (photograph courtesy of Lorna Tilley); Sub-adult and adult burials AS09H1M3-4 from An Sơn (photograph courtesy of Trần Thị Kim Quý).