



Secondary burial practice at megalithic jar site 1, Plain of Jars Laos

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Abstract

In 2020 a Lao/Australian archaeological research team revisited one of the largest megalithic jar sites in Laos, Site 1, and undertook excavations in an effort to more fully understand the ritual practice at the site. This paper reviews previous research undertaken at the site and describes the recent excavation which revealed evidence of secondary burial practice dating to the 8th to thirteenth centuries. The research confirms the use of Site 1 as a burial site where multiple individuals were interred in secondary burials in shared mortuary contexts.

Keywords Megaliths · Archaeology · Laos

1 Introduction

The megalithic jar sites, often collectively referred to as the Plain of Jars, are located in northern Laos, predominantly in Xieng Khouang with some in neighbouring provinces. These sites comprise large, hollowed stone receptacles fashioned from various types of stone including sandstone, breccia, limestone, conglomerate and granite. The raw material for the jars comes from the local area and quarries have been identified near some sites. The plateau on which most of the jar sites are located comprises rolling terrain interspersed with hills and shallow river valleys. The geology beneath

the topsoil comprises limestone (in areas, a Fengcong karst landscape), siltstone and sandstone bedrock and to the west, outcrops of rhyolite have been identified and to the east, fault bounded graben. Granite is also found on the plateau (Van Den Bergh *n.d. a*). The jar sites are found over an area of more than 10,000 km², with 129 sites now confirmed, found mostly atop hills, or in mountainous locations. The number of jars vary with between one and more than 400 jars in some locations. The jars were first explored archaeologically by the French scholar Madeleine Colani (1935).

Since 2016 a joint Lao-Australian research team has undertaken documentation and excavation at several megalithic jar sites in north-central Laos (O'Reilly et al. 2019a; O'Reilly et al. 2019b; Skopal et al. 2020) with excavations having been undertaken at Site 1 (O'Reilly et al. 2019a), Site 52, (O'Reilly et al. 2019b) and at a third site 12 km from Site 1, called Site 2 (O'Reilly et al. 2022b) (Fig. 1).

Site 1 was first excavated by the authors in 2016 (O'Reilly et al. 2019a) and in 2020 the authors returned to the site to expand excavations there. Site 1 comprises five groups of large jars, mostly of sandstone and conglomerate and hundreds of quartz-rich breccia boulders scattered around a limestone cave. Group 1 has been excavated in the past (by Colani and Sayavongkhamdy) but activity since the 1970s has considerably disturbed the archaeological contexts. For this reason the authors focused their efforts on the largest and less disturbed group of jars at the site, Group 2.

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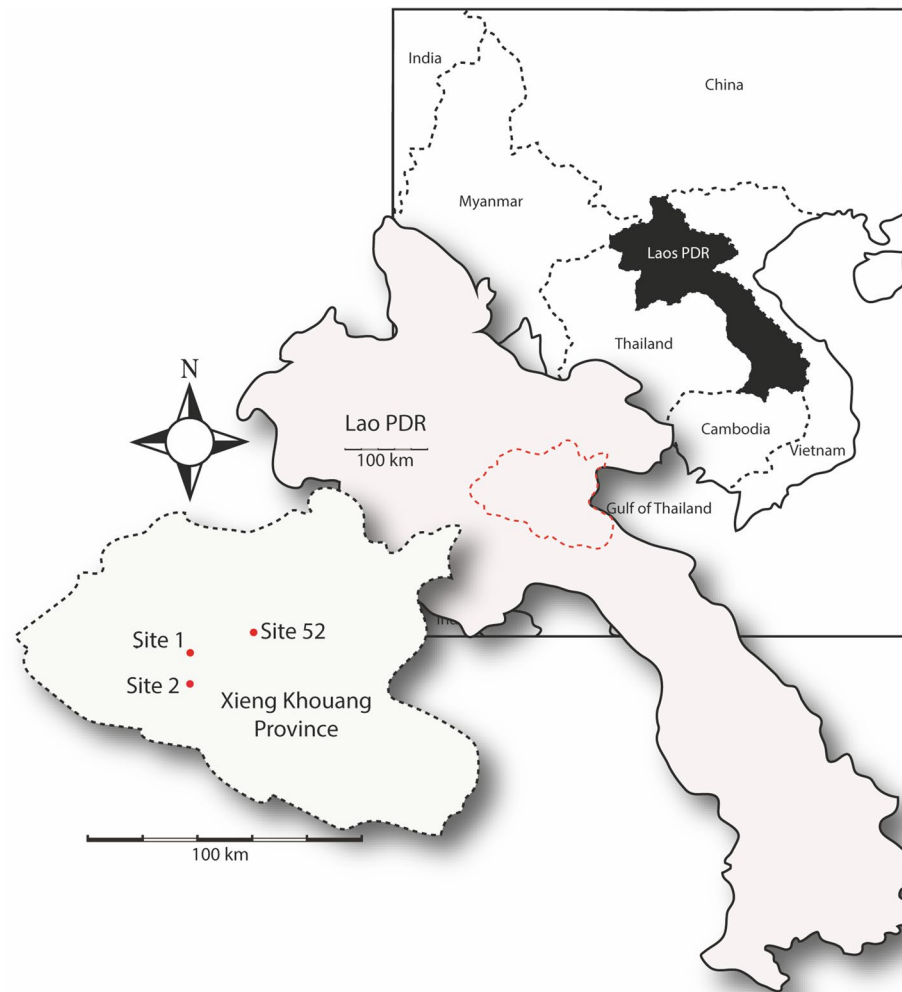
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Fig. 1 Map of Laos showing locations of sites mentioned in the text



Here we review previous research undertaken in Group 2 at Site 1 and present the findings from the excavations undertaken in 2020 including the discovery of four mortuary contexts which contained the remains of at least 12 individuals.

2 Previous research in group 2, site 1

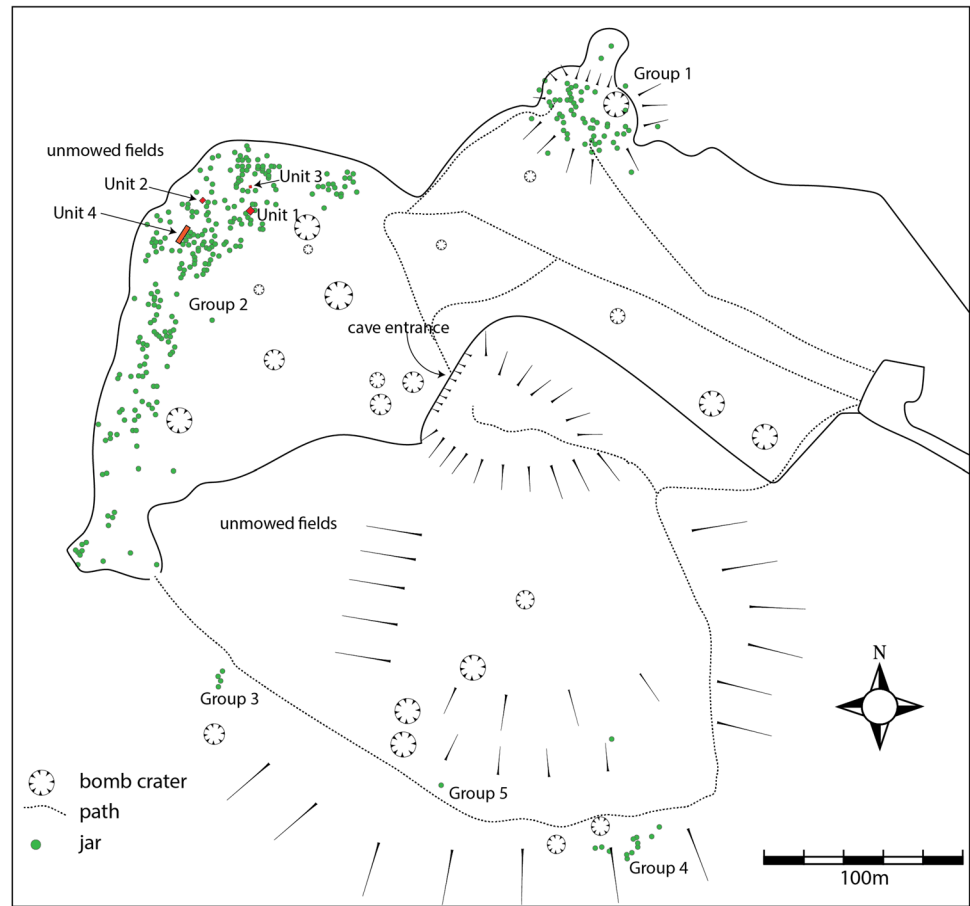
Site 1 comprises five groups of jars (Fig. 2), the first group of 60 jars is located on a small hill at the north of the site, while the largest group (227 jars) lies to the west of this and forms a large crescent of jars which faces a limestone hill with a large cave to the east. Groups 3 (12 jars) and 4 (four jars) lie south of Group 2 and Group 5 (13 jars) lies at the highest elevation to the south of Group 1. Prior to the recent research at Site 1, four archaeological investigations have been conducted at the site. While some investigations have been undertaken elsewhere at the site we will

review the research focussed on Group 2 in this paper as our recent research was focussed there. The first excavations were undertaken by Madeleine Colani in the 1930s (Shewan and O'Reilly 2019). After a lacuna of several decades, a minor excavation was undertaken by Eiji Nitta (1996) and later by Thongsa Sayavongkhamdy (n.d.) in the 1990s. Julie Van Den Bergh (n.d. b) conducted minimal rescue operations at the site in 2007.

3 Colani

In Group 2 (Fig. 2), Colani excavated in three locations. It is difficult now, to ascertain the exact location of Colani's (1935 v.2:35) excavations but she reported that digging under the jars proved to be "almost invariably fruitless". In her excavations in Group 2, Colani reports finding a number of earthenware vessels, some of which had a coarse

Fig. 2 Map of Site 1, Xieng Khouang, Laos. Icons in red represent the location of excavation units



glaze (Shewan and O'Reilly 2019). The ceramic vessels are described as sub-cylindrical, some containing fragments of bone.

As well as these sub-cylindrical vessels, Colani found small ceramic vessels, not exceeding 5 cm in height, which resemble the large megalithic jars in form. Other artefacts discovered included bowls, ear discs with concave edges, ceramic weights and beads, carnelian and glass beads, artefacts of bronze and iron including a chisel (23 cm long), tanged knives, ear-pendants and bangles, and spherical bronze bells decorated with a spiral design. Following the work of Colani there was a hiatus in archaeological research at Jar sites until the mid-1990s.

4 1994 Excavations

Nitta (1996) excavated four intersecting trenches around a jar decorated with a carved human figure (<https://plain-of-jars.org/jars/01020188/>) in Group 2. This work exposed seven pits, each covered by a flat stone. Unburned human bones and teeth were found in these pits, some of these remains were associated with iron knives and glass beads.

One of the pits contained a 60 cm tall, glazed and incised ceramic jar with a lid. The jar contained fragments of skull, femur and humerus and three teeth. Nitta (1996) asserts that the pits are likely contemporaneous to or earlier than the megalithic jar emplacement. He suggests that the megalithic jars, pit and ceramic jar burials belong to the late first millennium AD, “made around the ninth to tenth century AD” (Nitta 1996:17).

5 1996 Excavations

Sayavongkhamdy excavated in various locations at Site 1 in 1996 (Sayavongkhamdy and Bellwood 2000) but here we describe only the excavations in Group 2 as they were adjacent to the excavation undertaken in 2020.

Sayavongkhamdy (n.d.) excavated a 3 × 3 m area around four megalithic jars (Fig. 3). The unit was centred on Jars 184 (re-labelled 01,020,128) and 187 (01,020,127) and oriented north–south. The first few cm of excavation revealed two areas of sandstone chips and irregular blocks. Sayavongkhamdy (n.d.) identified 11 pits, six of which sat beneath either limestone cobbles (n = 2), pavements of sandstone chips (n = 2) or sandstone blocks (n = 2), one of which was

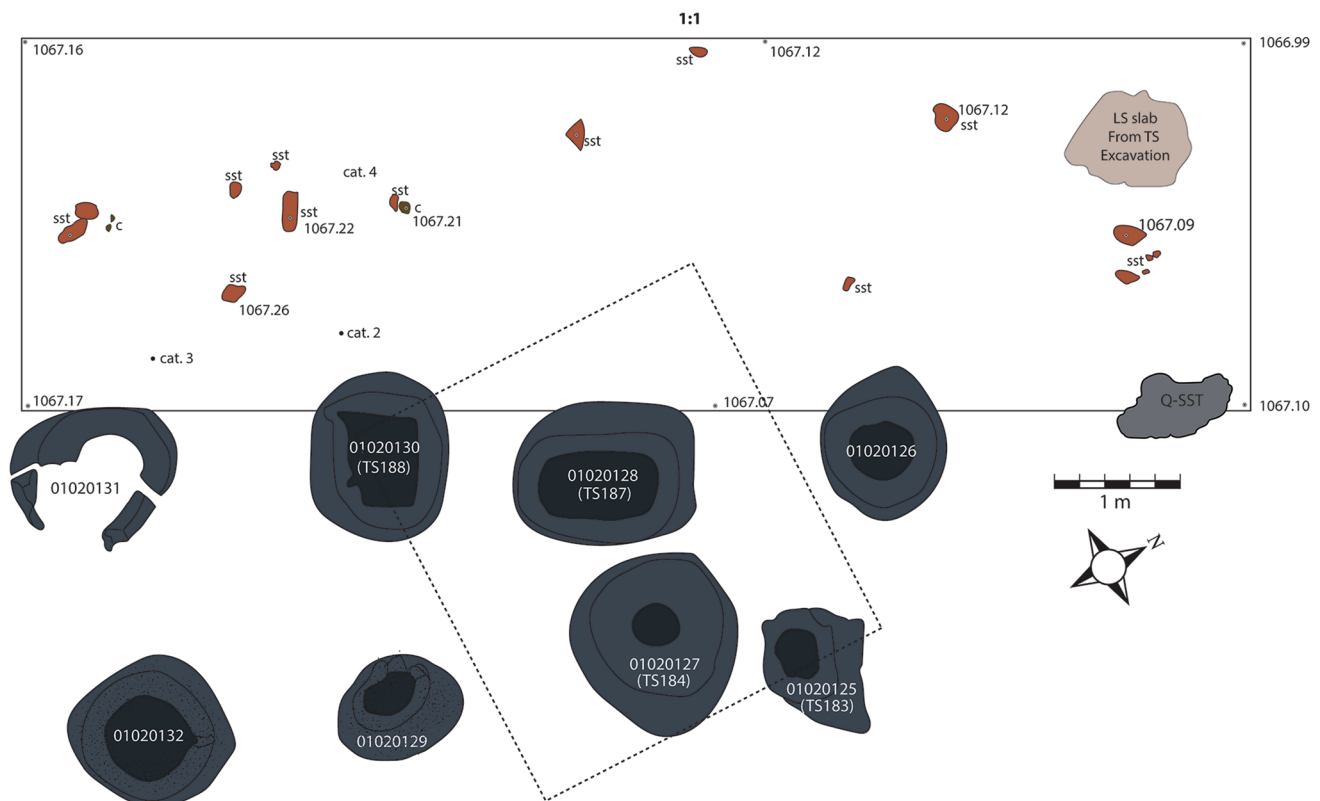


Fig. 3 Plan view of Unit 4 at Site 1, Layer 1, spit 1. Megalithic jars represented in dark grey. F = feature, cat. = catalogued artefact, circled dots = elevation above sea level, L = limestone, C = ceramic, sst = sandstone. Dotted line represents 1996 excavation

carved depicting a naked couple. Artefacts found in these pits comprise miniature pots, ceramic sherds, two iron bangles, a bronze bell, carnelian and unidentified stone beads, nephrite beads, glass beads and fragments of charcoal. In one, a stone pendant was found which is similar to the pendant found by Colani at Ban Xot (Colani 1935 vol.2 83). Another pit contained a large, cylindrical, ceramic vessel beneath a pavement of sandstone chips. No bone was found inside this vessel but it is thought by Sayavongkhamdy to represent a secondary burial. This thin-walled vessel was flat-bottomed and red in colour.

Human remains were found in two of the pits, one with just a human tooth but another containing two human skulls, teeth and four long bones sitting atop a charcoal lens. Charcoal and bone was collected during these excavations and a sample of charcoal (S33-ANU) taken from the bottom of one of the pits at 72 cm of depth, returned a date of 8150 ± 90 BP (7468–6827 BC). A fragment of the skull (lab number lost) from the same pit was AMS dated and returned a date of 3410 ± 190 BP (2282–1265 BC). Another pit contained charcoal (ANU-10767, ANU-10764) which returned dates of 920 ± 50 BP (1027–1220 AD) and 8320 ± 100 BP (7577–7079 BC) respectively (Sayavongkhamdy n.d.).

6 2004 Rescue excavations

During the UXO clearance in Group 2, five units were excavated based on the discovery of what appeared to be burial assemblages (Van Den Bergh and Luangaphay n.d.).

In the first trench excavated, coarse, glazed, sherds decorated with incised lines were found in association with burned human bone and a bi-point lithic artefact. The second trench revealed three separate contexts, one comprising a concentration of coarse, thin-walled ceramic sherds and a small, crushed, pot, similar to that found by Sayavongkhamdy (1998:9–10) and Colani (1935, pp.41–43). Charcoal (A6146) from this context dated 935 ± 50 BP (1018–1210 calAD 95.4%). The second context was found beneath a quartz-veined breccia boulder and contained similar coarse ceramic sherds, bone fragments and stone artefacts. The third context in this trench contained incised and glazed ceramic sherds and a large carved stone. The latter sat directly atop two ceramic burial jars. A third trench revealed ceramics and the fourth revealed the presence of two ceramic vessels, interpreted as burial jars by Van Den Bergh. Only one of these vessels was removed. The fifth unit of excavation exposed a modern, military bugle.

7 2016 Excavation

The authors excavated in three locations at Site 1 in 2016 (O'Reilly et al. 2019a) leading to the discovery of secondary burials of human bone (in Unit 1) beneath a large sandstone disc and associated with limestone blocks, pavements of chipped sandstone, secondary burial of human remains in ceramic vessels (in Unit 3) and, for the first time, a primary burial of two individuals (in Unit 2). A minimum number of 18 individuals were identified from these mortuary contexts representing the remains of individuals spanning all ages and both sexes with over 60 per cent of the mortuary population being younger than 15 years of age. This number of individuals and the number of very young individuals, suggesting a high fertility rate, buried in an area of 49m² may indicate either a growing population at the time of their interment (O'Reilly et al. 2019a), and/or burial reuse.

The 2016 excavations exposed material culture similar to that found during previous research at Site 1, including earthenware ceramic sherds and complete miniature ceramic 'jars' which resemble the large stone jars of the site. Other finds included lithic pendants, ceramic ear discs and glass and carnelian beads. The 2016 excavations also confirmed that the boulders found at Site 1 served to demarcate sub-surface interments, as did the carved sandstone discs. The charcoal and bone that was retrieved from the excavated areas indicate that the mortuary activity took place between the eighth and thirteenth centuries AD (see O'Reilly et al. 2019a for details of excavations).

8 2020 Excavation campaign

With the aim of gaining a more comprehensive understanding of the use of Site 1 and based on the finds made by Sayavongkhamdy in 1996, in 2020, the authors decided to expand the area of his excavation. This unit was named Unit 4.

A 10×3 m unit was established adjacent to a line of four megalithic jars which are aligned running north-east at 30° (Fig. 3). Unit 4 overlapped slightly with the north-west corner of the unit excavated by Sayavongkhamdy.

Excavation was undertaken using arbitrary 10 cm spits and layers, the latter designated by changes in the soil colour. The upper-most layer was designated as Layer 1, spit 1. Features uncovered in each spit were labelled sequentially and are denoted herein with the layer, spit and feature number. The soil removed from the unit was sieved through 5 mm screens.

A 10 cm spit was removed from Unit 4 revealing a number of dispersed sandstone pebbles. Few artefacts were discovered aside from a piece of quartz crystal, military

artefacts associated with the conflict in Laos in the 1970s, three earthenware ceramic sherds and two coins, one with a string of beads attached. One of the coins appears to be a French colonial-era 20 cent piece dating to 1906 and the other is dated 1926 but these may be reproductions. There were no features evident (Fig. 3).

The excavation of the second spit (Fig. 4) revealed the presence of 25 limestone and eight irregular sandstone boulders of varying size, and fragments of sandstone disc, one found in the middle of the unit, and another on the eastern baulk (these did not match). Several of the boulders were labelled as features where they were found in groups. Along the western baulk of the unit a large scatter of gravel and oblong, rather crudely made, ceramic beads were found.

A number of earthenware sherds were found in this spit along with several broken ceramic vessels. Other artefacts in the second spit comprised a basalt flake, three hammerstones, a ceramic weight, an iron chisel, a spindle whorl, an iron bangle fragment, a cylindrical clay object, possibly an ear plug or gaming piece, and a carnelian bead.

Spit 3 revealed the presence of 11 features which appeared to be pits, apparent after the removal of limestone boulders which sat atop them (Fig. 5). One of these apparent pits was found beneath and around one of the partial sandstone discs which was placed atop a limestone slab. The matrix around the limestone was gravelly and the soil under the limestone was dark brown (7.5YR 4/4). A number of artefacts were found within this feature including ceramic earthenware sherds, found beneath the limestone slab, clay beads, a small piece of bone and some charcoal. Two samples of charcoal were taken from the feature for radiocarbon dating (see below). Several of these features were revealed to be secondary burials.

On the east side of the unit, another feature of darker (7.5YR 4/4), gravelly soil was apparent near Jar 01020126 in which sat three large and one small limestone blocks. Some earthenware sherds and a small ceramic globular vessel in the east baulk. Upon removal of the limestone block, human teeth and bone fragments were discovered and the feature was labelled as Burial 1 (Fig. 5).

To the north-west of Burial 1 were found three pieces of limestone, a larger, square slab and two smaller irregular pieces, in the middle of the unit. Human bone was found in association with the limestone and this feature was subsequently labelled as Burial 2 (Figs. 5 and 6). A few ceramic sherds were recovered around the limestone.

In the north of the unit, a large collection (n = 14) of limestone blocks of varying sizes sat upon a darker, gravelly soil (5YR 3/2) flecked with charcoal and small pieces of quartz. A sample of this charcoal was taken for radiocarbon dating (see below). Originally labelled 1:3 F8, the name was changed to Burial 3 upon discovery of human bone beneath one of the pieces of limestone (Figs. 5, 6, 7 and 8). More

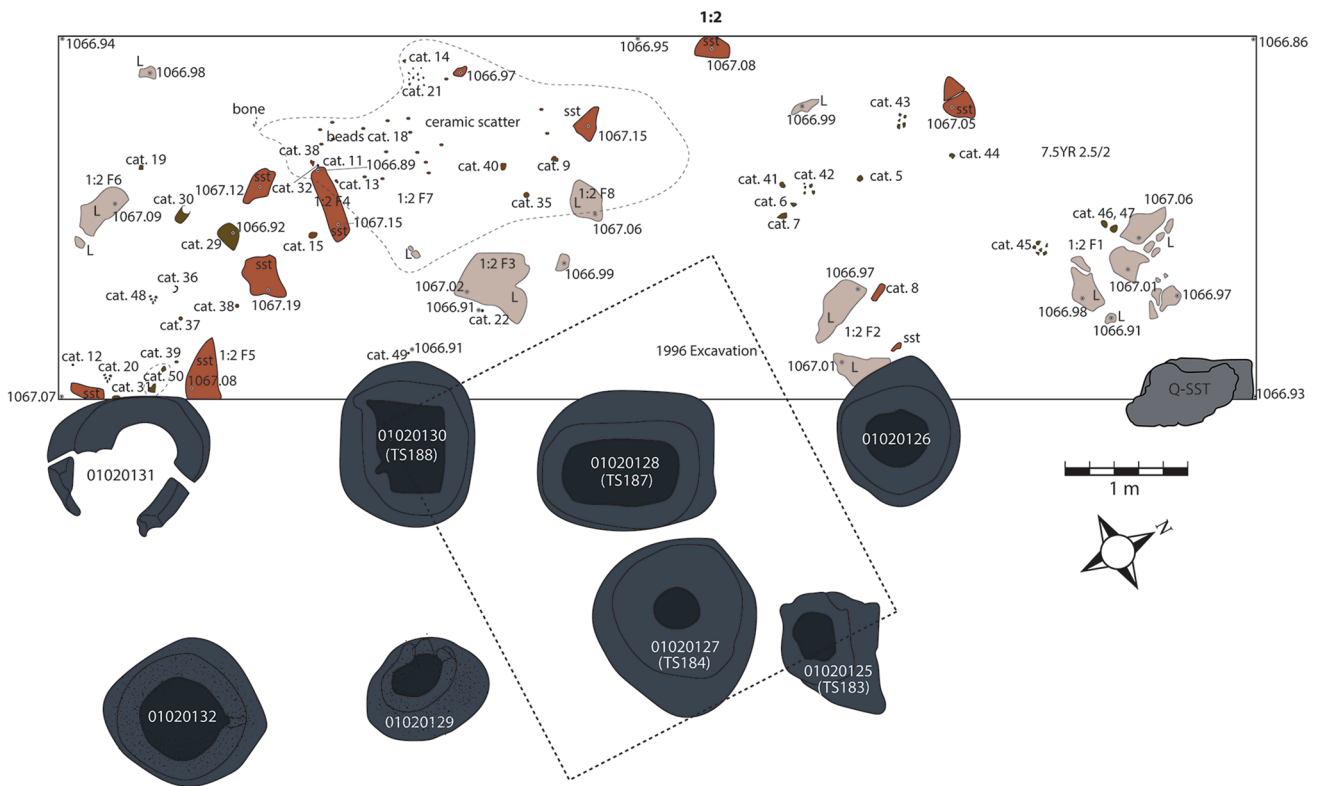


Fig. 4 Plan view of Unit 4 at Site 1, Layer 1, spit 2

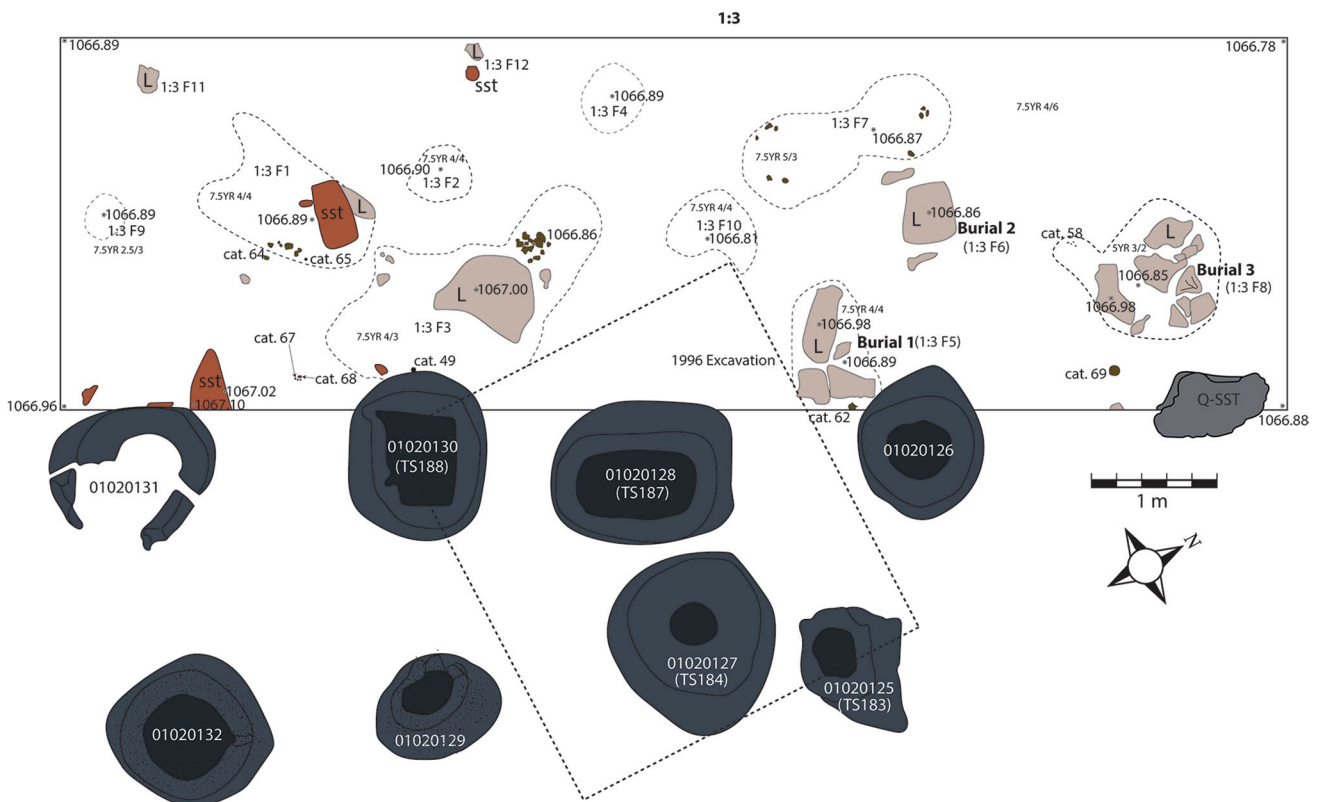


Fig. 5 Plan view of Unit 4 at Site 1, Layer 1, spit 3

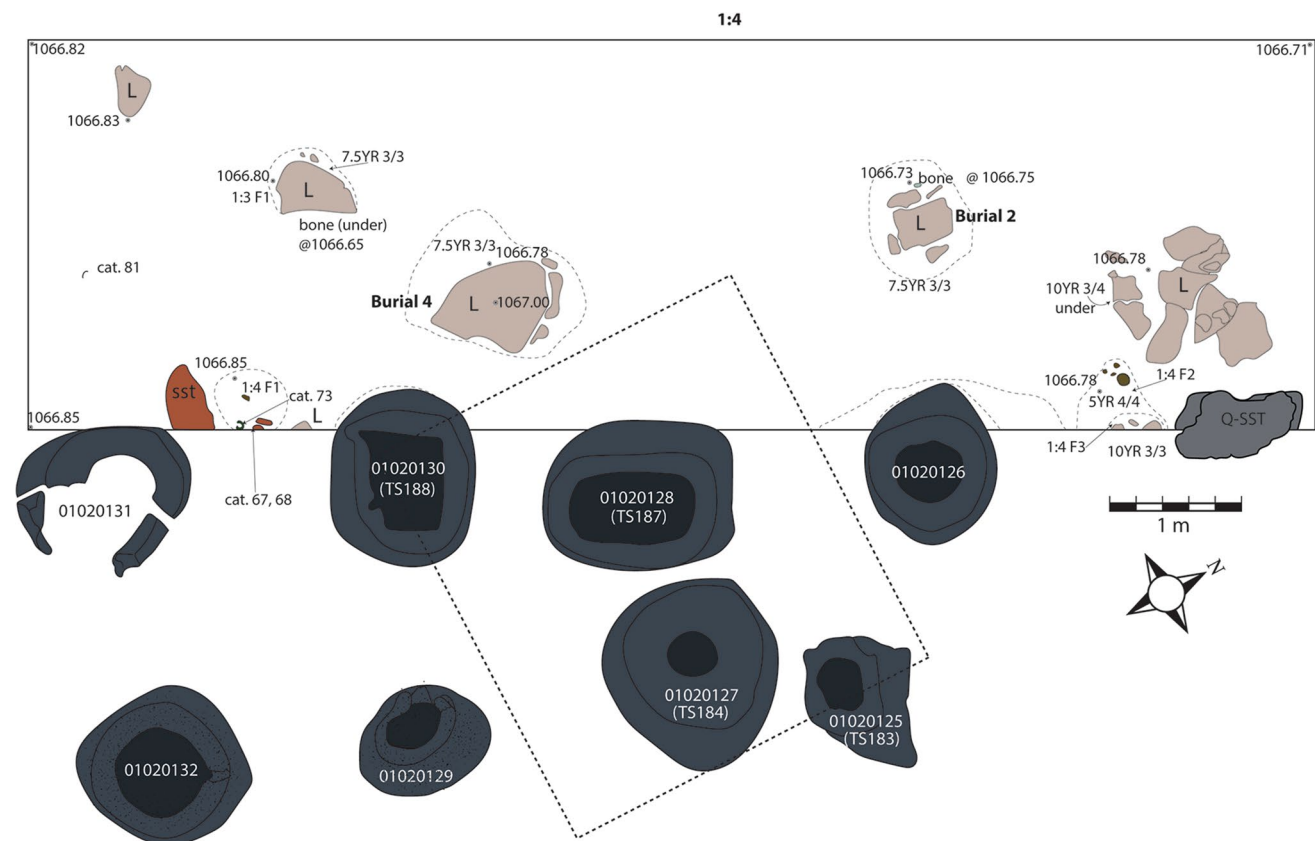


Fig. 6 Plan view of Unit 4 at Site 1, Layer 1, spit 4

small limestone slabs, bone and ceramic shers appeared as excavation continued. In total, four fragmentary human skulls were uncovered in the feature as well as some fragmentary bone.

Near Jar 01020130 another feature named 1:3 F3 extended into the unit—the soil was gravelly and different in colour (7.5YR 4/3) to the surrounding matrix (7.5YR 4/6). There was some red (10R 4/8) clay mixed into the feature's matrix indicating it had been excavated, in the past, into the natural substrate. This large feature encompassed a substantial limestone slab and some smaller limestone chunks. Found within the feature were a broken ceramic vessel and some earthenware sherds. The two limestone blocks were removed from the feature and three human skulls and long bones were found within the pit and it was renamed Burial 4 (Figs. 6, 7 and 9). A fragment of this bone was sampled for radiocarbon dating (see below) and a piece of charcoal from the burial context was also sampled.

One other feature (1:3 F9), located beneath a limestone block, contained bone and a small ceramic vessel. It was not designated as a burial due to the inability to definitively identify the bone as human.

Five further pit features were found, two were devoid of artefacts and three contained earthenware ceramic sherds. Elsewhere in the unit at this level were found some ceramic sherds, a hammerstone and an iron fragment.

In spit four, two further features were revealed (Fig. 6). The first was in the east baulk near the southeast corner of the unit adjacent to the broken sandstone disc. This circular pit was visible due to a differentiation in soil texture (fine gravel) and contained four bronze bells, a bronze bangle and a clay bead.

The second feature in this spit was also on the east baulk near the northeast corner of the unit and comprised three pieces of limestone protruding from the baulk. The soil in this area was of a slightly different colour (5YR 4/4) to the surrounding matrix and within the feature, ceramic sherds were found. Beneath a piece of limestone, some poorly preserved, unidentifiable, bone was encountered and some earthenware ceramic sherds.

After removing a further 10 cm of matrix in Unit 4 (spit 5), two small circular features were apparent and Burials 2, 3 and 4 were fully exposed (Fig. 7). One of the circular features, 25 cm in depth, contained flecks of charcoal and earthenware sherds and a thin layer of lighter coloured gravel. The second feature comprised mottled red (10R

Table 1 Radiocarbon dates obtained during the excavation of Unit 4, Site 1. Calibrated radiocarbon ages are presented at 95.4% confidence, using OxCal v.4.4 and the IntCal 20 calibration curve (Brock et al. 2010; Ramsey 2017)

Provenience in Unit 4	WK#	Material	Date BP	cal BC/AD
1:3 Feature	51194	charcoal	975 ± 25 BP	1021–1158 AD
1:3 Feature	51200	charcoal	828 ± 25 BP	1175–1268 AD
Under stone jar 01020130	51199	charcoal	1059 ± 61 BP	774–1156 AD
1:3 Feature 8 Burial 3	51,203	charcoal	867 ± 26 BP	1051–1257 AD
1:3 Feature 3 Burial 4	51198	charcoal	864 ± 28 BP	1052–1260 AD
1:3 Feature 3 Burial 4	51202	charcoal	1005 ± 25 BP	991–1150 AD
1:3 Feature 3 Burial 4	51262	human bone	1144 ± 23	773–987 AD

fragments, but, given the range of tooth wear, it was likely these three teeth belonged to at least two individuals. Burial 2 held only a small collection of likely human bone fragments.

Burial 3 (Fig. 8) represented a MNI of five people based on the presence of five left petrous temporal bones and supported by the dental remains present. The remains, comprising four crania, a range of dental remains and incomplete cranial and postcranial bones, are disarticulated. Two crania are represented by fragments only and are of indeterminate age and sex. A maxilla and mandible belong to an 11.5–13.5-year-old, one of the crania is possibly that of an adult female (age at death, unknown), and another is from a young adult of unknown sex. The latter cranium also had possible evidence of dental ablation or agenesis of both the maxillary lateral incisors and the maxillary canines. This symmetrical pattern of loss is more suggestive of intentional ablation, an activity known to have occurred in the late Pleistocene site of Tam Hang in northern Laos (Willman et al. 2016), as well as a range of sites in prehistoric Cambodia, Vietnam and Thailand (Domett et al. 2013; Newton and Domett 2017). The dental remains also indicated some people suffered from caries, periapical infections and antemortem tooth loss. One mandible, for example, had lost six teeth antemortem, all first and second molars as well the left third molar and the right second premolar. Caries lesions were often found at the cemento-enamel junction and interproximally. Fragmented postcranial remains comprised parts of humeri, radii, ulnae, femora and tibiae. One adult femur had a possible peri or post-mortem cut mark (15.4 mm in length) on the lateral aspect just proximal to the midpoint of the shaft which requires further investigation.

Burial 4 (Fig. 9) included a minimum of four individuals based on the presence of four crania and included a range of cranial, dental and postcranial remains, including hand and foot bones, but with no clear anatomical articulation evident. The remains in Burial 4 were uncovered in a single layer whereas those in Burial 3 were in layers within a deeper, but narrower pit. One of the crania and one of the mandibles in this burial likely belong to adult females. The female cranium had a 62.5 mm peri- or post-mortem cut mark across the posterior aspect of the left parietal bone that

requires detailed investigation. Three other crania were not able to be assessed for age or sex but at least one was adult and a further was possibly subadult. The dental remains demonstrated evidence of caries, again commonly cemento-enamel junction and interproximally located. There were also cases of periapical infection. One of the tibiae was from a subadult, probably an older child or young adolescent.

The location of the burial pits containing the secondary burials of multiple individuals did not seem to have any direct or consistent relationship to the location of the megalithic jars at Site 1. Research undertaken in 2016 (O'Reilly et al. 2019a) and unpublished reports from previous excavations (Sayavongkhamdy n.d.; Van Den Bergh n.d. b) seem to indicate a relationship between the interment of bundles of bone and limestone slabs and sandstone discs at Site 1. The site also contains hundreds of quartz-rich granitoid boulders which seem to have been used to mark the location of subterranean ceramic jars containing human remains, often those of infants. It is unclear whether the secondary burials (both bone bundles and ceramic jar burials) are contemporaneous with the megalithic jars but this issue may be clarified as Optically Stimulated Luminescence (OSL) dates are currently being prepared.

10 Dating

Six charcoal samples and one bone sample were taken for radiocarbon dating from four contexts during the excavation of Unit 4. The results are presented in Table 1.

11 Discussion

The purpose of excavating a fourth unit at Site 1 was to explore further the mortuary traditions identified in previous excavations and build on the discoveries in the same area made by Sayavongkhamdy (n.d.). In previous excavations (O'Reilly et al. 2019a) there appeared to be a relationship between boulders, limestone slabs, discs and secondary interments (either bundles of bone or ceramic jars containing human remains) and the 2020 excavations were undertaken



Fig. 10 Iron implement possibly representing a chisel found in Unit 4 at Site 1 during 2020 excavations

to confirm this hypothesis. Here we will review some of the notable items of material culture excavated during the 2020 research before turning to discuss the human remains found and the dating of these contexts.

The discovery of a probable chisel during the excavation of Unit 4 at Site 1 is of considerable interest. The chisel-like artefact found during the 2020 excavations measures 71 mm in length and the tip is 3.9 mm wide but, as the implement is corroded, the actual tip width is expected to have been narrower (Fig. 10). As such it may represent a ‘point chisel’ used to remove stone from an object after it has been quarried (Wooton et al. 2013). This type of tool tends to leave sharp, narrow, and well-defined marks as they are struck along the rock surface with a hammer or mallet (Wooton et al. 2013). The megalithic jars at Sites 1, 2 and 3 and at the quarry sites 8 and 21 were investigated by Tener (2020) to assess the method of jar creation. Tener made moulds of the manufacturing scars taken from the interior of several jars at these sites for comparative purposes. The scars on the jars at the sites investigated by Tener (2020) are nearly identical in size to the tip of the chisel (< 0.5 mm difference) lending credence to the identification of this object as a chisel. Colani also reports finding a socketed “denticulated bronze chisel” at Site 1, noting tool marks on many jars likely to have been made by a chisel (Shewan and O’Reilly 2019:140, 497).

Fig. 11 Artefacts recovered during the excavation of Unit 4, Site 1. **A.** clay beads, **B.** opaque glass beads, **C.** copper bangle, **D.** Carnelian bead, **E.** bronze bells with coil designs

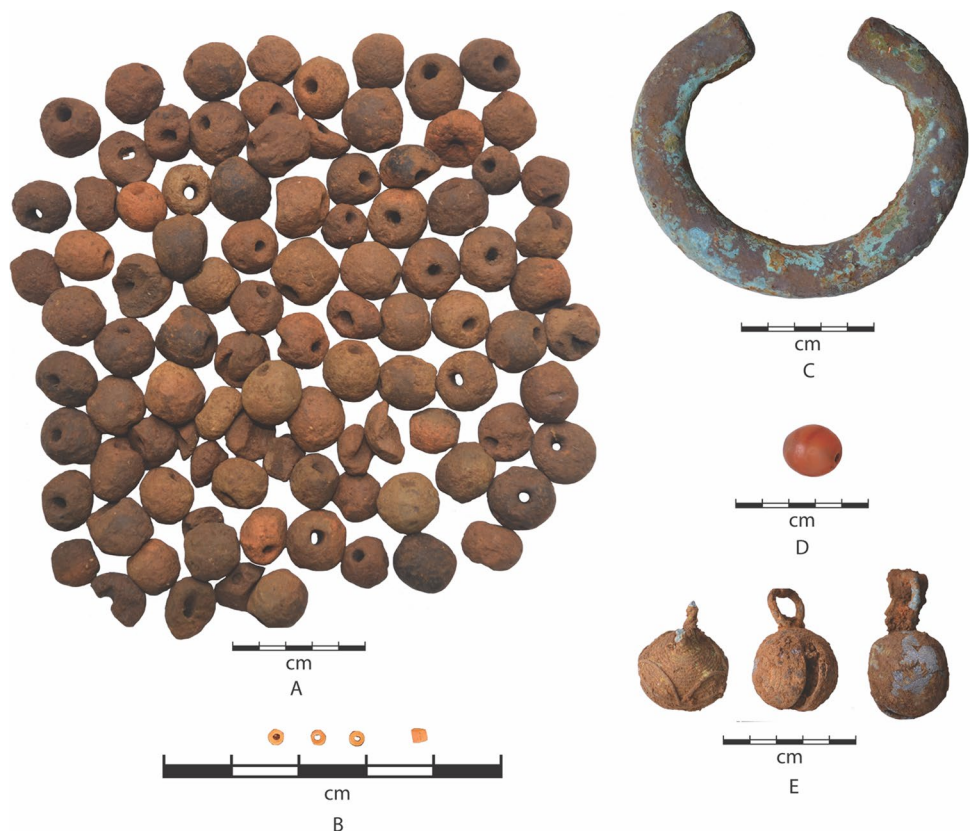
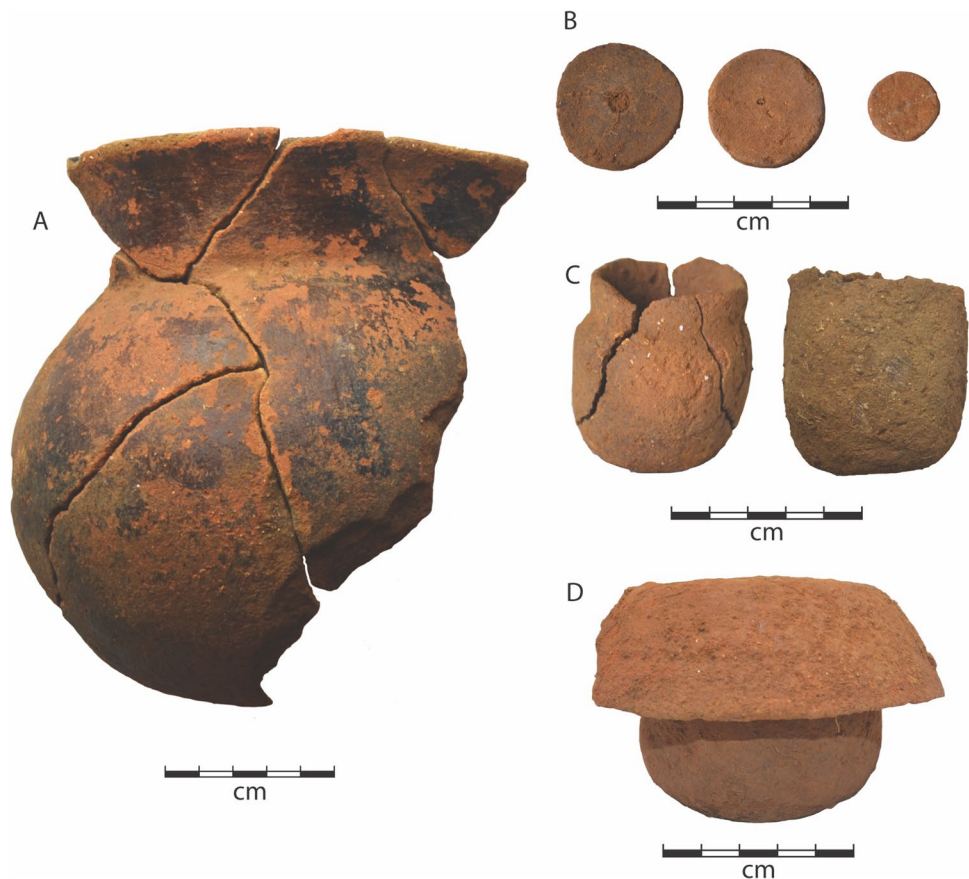


Fig. 12 Artefacts recovered during the excavation of Unit 4, Site 1. **A.** globular earthenware vessel similar to those found by Colani, **B.** perforated earthenware discs, **C.** earthenware vessels possibly representing the megalithic jars in miniature, **D.** earthenware vessel with a bowl placed atop



The other items of material culture found in Unit 4 at Site 1 include jewellery. Dozens of clay beads (Fig. 11a) were found scattered over a large area in Unit 4 (Fig. 4). These are rough, oblong (c. 2×1 cm), earthenware beads with a large perforation. Other items of jewellery include opaque, terracotta-coloured glass beads (Fig. 11b) and a robust lead-alloyed copper bangle¹ (Fig. 11c), (Sullivan pers. comm. 2022). A carnelian bead (Fig. 11d) and three spherical bronze bells (Fig. 11e) with a delicate filigree decoration on the exterior were also found.

Hundreds of earthenware sherds were recovered during the excavation of Unit 4, as were several partially complete ceramic vessels including a globular vessel with a glaze (Fig. 12a), three ceramic discs, identified as spindle whorls (Fig. 12b), several small semi-cylindrical vessels (Fig. 12c) and one small vessel with a larger bowl placed atop it as a lid (Fig. 12d).

Other items found include quartz crystals ($n=2$), a basalt flake, a whetstone, hammerstones ($n=5$), and iron bangle fragments ($n=2$).

The items of material culture recovered from Unit 4 are similar to those found during previous excavations at Site 1 and to other megalithic jar sites excavated by the authors in Laos (Sites 2 and 52). The bronze bells are similar to those found at Site 2 (O'Reilly et al. 2022a, 2022b) and Colani found similar bells at the site of Ban Xot, Lat Sen, Ban Soua, Ban Na Seo and Site 1 (Shewan and O'Reilly 2019:778, 755; 734, 743, 776). She also recovered a clay mould for producing bronze bells (Shewan and O'Reilly 2019:759). They have also been found in excavations in Lao Pako (Källén 2004), Sepon (Chang pers. comm. 2022) in Laos, Sa Huynh in Vietnam (Dzung 2009), Cambodia (Mansuy 1923, pl. VIII, O'Reilly et al. 2015, O'Reilly et al. 2020) and Thailand (Chang 2001; Higham et al. 2007) at sites dating to the Bronze and Iron Ages.

Colani reports finding a nearly identical copper bangle to that found in 2020 in the cave at Site 1 (Shewan and O'Reilly 2019:776) as well as carnelian beads (Shewan and O'Reilly 2019:616) and opaque, terracotta-coloured, glass beads (Shewan and O'Reilly 2019:742) and beads similar to the clay beads (Shewan and O'Reilly 2019:739).

The ceramics found during the excavation of Unit 4 also have parallels from previous excavations. Glazed, globular pots, similar to those mentioned above, were identified by Colani at Site 1 which she termed either cooking or

¹ The bangle is currently undergoing conservation at the Grimwade Centre for Cultural Materials Conservation, University of Melbourne.

cremation pots, noting they contained “fragments of ...fire-blackened bone.” (Shewan and O'Reilly 2019: 403, 783). So too, did Colani (Shewan and O'Reilly 2019:743) discover similar miniature pots resembling the large stone jars in form at Site 1. The ceramic vessel with a bowl set atop it, found in Unit 4, may have parallels to mouth-to-mouth pots discovered by Colani (Shewan and O'Reilly 2019:472, 736) at Thao Kham. The discs found in 2020 resemble what Colani calls ear plugs but do not have a groove on the outer edge which would have served to keep the ornament in place in the ear nor do they have decorations as those found by Colani do (Shewan and O'Reilly 2019:739).

Unit 4 was also found to contain what are likely hammerstones, spherical rocks with evidence of percussive damage. Similar objects are mentioned by Colani (Shewan and O'Reilly 2019:215) who found them in the cave at Site 1. Whetstones, found in Unit 4 are also noted by Colani from San Hin Oume, Lat Sen, and Na Nong (Shewan and O'Reilly 2019:225, 466, 468) as well as Site 1 (O'Reilly et al. 2019a, 2019b).

While Colani (Shewan and O'Reilly 2019) does not report bundles of human bone from her excavations at the jar sites, she does, however, note the significance of limestone slabs in the matrix surrounding the megalithic jars at Site 1 (Shewan and O'Reilly 2019:423). During the excavation of Unit 1, Site 1 in 2016 (O'Reilly et al. 2019a) human remains beneath limestone slabs were found in three areas comprising the remains of 12 individuals. One of these bundles was found atop limestone slabs beneath a large sandstone disc. A smaller fragment of a sandstone disc was uncovered during the excavation of Unit 4 which sat atop limestone slabs with unidentifiable bone between them which may represent a similar mortuary practice.

The dates obtained from the excavation of Unit 4, falling in the 8th to thirteenth centuries are, largely, congruous to those obtained in the 2016 excavation at Site 1. In Unit 1 radiocarbon dates also ranged from the 8th to the thirteenth century although two very early dates were returned as well. Unit 2 returned dates from the 9th to thirteenth centuries, again with two very early dates and Unit 3 returned dates from the 10th to twelfth centuries with four very early dates and a date from human bone that feel between eighth and tenth centuries (O'Reilly et al. 2019a). The early dates from these contexts are hypothesised to relate to earlier contexts which were disturbed in the excavation of the mortuary contexts. Excavations at Site 2 also returned radiocarbon dates but in some instances, these were earlier than those found at Site 1. In Unit 1 at Site 2 dates ranged from the eighth century to the twelfth century (two late dates were also returned, possibly related to recent activity at the site). Units 2 and 3 at Site 2 returned dates from the 7th to eighth century

(Shewan et al. 2021). Optically Stimulated Luminescence dates, obtained from sediments from beneath the jars at Site 2, suggest the emplacement of the megaliths as early as the 2nd millennium BC (Shewan et al. 2021). How the secondary burials (both bundle and ceramic jar) relate to each other and to the megalithic jars requires further investigation. OSL samples taken during the 2020 excavation may aid in this endeavour, as might further radiocarbon dating of bone should the ceramic jar burials render samples suitable for dating. What is evident is that this site has produced divergent mortuary practices (primary, secondary and ceramic jar burial) and has maintained ritual significance for an extended period of time.

12 Conclusion

The excavation of Unit 4 at Site 1 reached a depth of c. 50 cm when the natural substrate, undisturbed by anthropogenic activity, was met. Similar results to those reported by Sayavongkhamdy (n.d.) during his excavations around the same jars were found, a series of pits capped with worn limestone slabs, some of which contained human remains. These comprise the remains of several individuals of varying age and represent secondary burials. The matrix around these pits returned a range of artefacts, mostly ceramic sherds but some near-complete earthenware vessels, whetstones, items of personal adornment, spindle whorls and items that may relate to the carving of stone including an iron chisel and hammerstones. Only a few metallic items were found but this result should be viewed with caution as the upper 25 cm of the matrix at Site 1 had been cleared of UXO and all metal detected was removed in the mid-2000s.

The result of this excavation reveals that there is consistency in the mortuary practice in Group 2 at Site 1 with secondary burials being reported in the group in previous excavations in which multiple individuals were interred together in pits covered by limestone slabs or, less frequently, sandstone discs. The material culture also is consistent.

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Data Availability The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Conflict of Interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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References

- Brock, F., T. Higham, P. Ditchfield, and C.B. Ramsey. 2010. Current pretreatment methods for AMS radiocarbon dating at the Oxford Radiocarbon Accelerator Unit (ORAU). *Radiocarbon* 52 (1): 103–112.
- Chang, N. 2001. *Personal Ornaments in Thai Prehistory: Nong Nor, Ban Lum Khao & Noen U-Loke*. Doctoral Thesis, University of Otago, New Zealand.
- Colani, M. 1935. *Mégalithes du Haut-Laos*. 2 volumes. Publications de l'école française d'Extrême-Orient nos 25, 26.
- Domett, K., J. Newton, D. O'Reilly, N. Tayles, L. Shewan, and N. Beavan. 2013. Cultural Modification of the Dentition in Prehistoric Cambodia. *International Journal of Osteoarchaeology* 23: 274–286. <https://doi.org/10.1002/oa.1245>.
- Dzung, L.T.M. 2009. Sa huynh regional and inter-regional interactions in the thu bon valley, Quang Nam province, central vietnam. *Bulletin of the Indo-Pacific Prehistory Association* 29: 68–75.
- Higham, C.F.W., Kijngam, A. and Talbot, S. 2007. *The Origins of the Civilisation of Angkor volume II: The Excavation of Noen U-Loke and Non Muang Kao*. The Fine Arts Department, Bangkok.
- Källén, A., 2004. *And through flows the river: archaeology and the pasts of Lao Pako* (Doctoral dissertation, Afrikansk och jämförande arkeologi).
- Mansuy, H. 1923. Résultats de nouvelles recherches effectuées dans le gisement pré-historique de Somrong-Sen (Cambodge) suivi d'un résumé de l'état de nos connaissances sur la préhistoire et sur l'ethnologie des races anciennes dans l'Extrême-Orient méridional. *Bulletin de l'École française d'Extrême-Orient*, vol. X, fasc. 1 Hanoi.
- Newton, J., and Domett, K. 2017. The Biocultural Context Of Dental Modification In Prehistoric Southeast Asia In *A World View of Bioculturally Modified Teeth*, edited by S. E. Burnett and J. D. Irish. University Press of Florida, pp. 159–181.
- Nitta, E. 1996. Comparative study on the jar burial traditions in Vietnam, Thailand and Laos. *Bulletin of the Department of Archaeology, Faculty of Letters, Kagoshima University* 43:1–19.
- O'Reilly, D., L. Shewan, K. Domett, J. Newton, D. Evans, V. Voeurn, and N. Beavan. 2015. The Excavation of Phum Sophy 2009–2010: An iron age site in Northwest Cambodia. *Journal of Indo-Pacific Archaeology* 39: 57–73.
- O'Reilly, D., L. Shewan, K. Domett, and S. An. 2020. Revisiting Prei Khmeng: The Excavation of an Iron Age Settlement and Cemetery in Cambodia. *Asian Perspectives* 59: 33–60.
- O'Reilly, D., L. Shewan, T. Luangkhoth, A. Butphachit, and M. Khamphouong. 2022b. Further Excavations Among the Megaliths: Research at Plain of Jars Site 2 in Laos. *Journal of the Indo-Pacific Prehistory Association* 46 (1): 1–16.
- O'Reilly D., Shewan L., Domett K., Halcrow S.E. and Luangkhoth T. 2019a. Excavating among the megaliths: recent research at the 'Plain of Jars' site 1 in Laos. *Antiquity*. Aug; 93(370):970–89. <https://doi.org/10.15184/aqy.2019.102>.
- O'Reilly D., Shewan L., Khamphouong M. and Butphachit A. 2019b. Research at megalithic jar site 52 and the discovery of new jar sites in Xieng Khouang Province, Laos. *Asian Archaeology*. <https://doi.org/10.1007/s41826-019-00023-0>.
- O'Reilly, D., Shewan L., Khamphouong, M., Butphachit, A., Luangkhoth, T., Skopal N. and Bounxaythip S. 2022a. Ban Pha Tai: The excavation and dating of a buried megalithic jar in Xieng Khouang, Lao PDR. *Archaeological Research in Asia*. <https://doi.org/10.1016/j.ara.2021.100336>.
- Ramsey, C.B. 2017. Methods for summarizing radiocarbon datasets. *Radiocarbon* 59 (6): 1809–1833.
- Sayavongkhamdy, T., and P. Bellwood. 2000. Recent archaeological research in Laos. *Bulletin of the Indo-Pacific Prehistory Association* 19: 101–110.
- Sayavongkhamdy, T. n.d. Untitled, unpublished Doctoral dissertation Draft. The Australian National University.
- Sayavongkhamdy T. 1998. Recent Archaeological Research in Laos. Unpublished Paper presented at the Indo-Pacific Prehistory Association Conference, Melaka, Malaysia, June 1998.
- Shewan L, O'Reilly D. eds. 2019. *Madeleine Colani's megaliths of upper Laos*. Barcaray International Publishing, London. ISBN 9780648048206.
- Shewan, L., O'Reilly, D., Armstrong, R., Toms, P., Webb, J., Beavan, N., Luangkhoth, T., Wood, J., Halcrow, S., Domett, K. and Van Den Bergh, J., 2021. Dating the megalithic culture of Laos: Radiocarbon, optically stimulated luminescence and U/Pb zircon results. *PLoS one*, 16(3), <https://doi.org/10.1371/journal.pone.0247167>
- Skopal, N., S. Bounxaythip, L. Shewan, D. O'Reilly, T. Luangkhoth, and J. Van Den Bergh. 2020. Jars of the jungle: A report on newly discovered and documented megalithic jar sites in Lao People's Democratic Republic. *Asian Archaeology*. <https://doi.org/10.1007/s41826-020-00030-6>.
- Tener, S. 2020. *Visual and statistical analysis of tool scars on the Plain of Jars, Lao PDR: A chaîne opératoire of megaliths*. Honours Thesis submitted to Australian National University.
- Van Den Bergh, J. and Luangaphay, S. n.d. *Heritage Management at Plain of Jars Archaeological Landscape*. Unpublished Report to UNESCO and the Ministry of Information, Culture and Tourism.
- Van Den Bergh, J. n.d. (a) *Plain of Jars Archaeological Landscape: Heritage Management Plan*. Unpublished Report to UNESCO and the Ministry of Information, Culture and Tourism
- Van Den Bergh, J. n.d. (b) *Mission Report Site One*. Unpublished Report to UNESCO and the Ministry of Information, Culture and Tourism.
- Willman, J.C., L. Shackelford, and F. Demeter. 2016. Incisor ablation among the late upper paleolithic people of Tam Hang (Northern Laos): Social identity, mortuary practice, and oral health. *American Journal of Physical Anthropology* 160 (3): 519–528. <https://doi.org/10.1002/ajpa.22988>.
- Wootton, W., Russell, B., & Rockwell, P. 2013. 'Stoneworking Tools and Toolmarks (Version 1.0)', The Art of Making in Antiquity: Stoneworking in the Roman World, viewed 15 June 2020, <<http://www.artofmaking.ac.uk/content/essays/2-stoneworking-tools-andtoolmarks-w-wootton-b-russell-p-rockwell/>> . Accessed March 1, 2022