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## A report on the 2011–2012 excavation of Lovea: An Iron Age, moated settlement in Cambodia

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### ABSTRACT

Archaeological mounds surrounded by moats and embankments are common in the Mun River valley of the Khorat Plateau in Northeast Thailand. Sites with a similar morphology have been identified in neighbouring Cambodia but they are far less common. While several of the Thai sites have been subject to investigation only one moated site, to date, has been excavated in Cambodia. This paper presents the findings of the recent excavations at Phum Lovea.

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### 1. Introduction

Archaeological mounds surrounded by moats and embankments have been long noted in the Mun River Valley of Northeast Thailand (Boyd et al., 1999; Boyd and Habberfield-Short, 2007; Boyd and McGrath, 2001; Damrong and Prince, 1995; Higham, 1977; Higham and Kijngam, 2010; Moore, 1985, 1986, 1988; O'Reilly, 2014). Excavations at selected sites indicate that the moats and embankments date from the mid- to late Iron Age, c. AD 1–600 (Boyd et al., 1999; Boyd and Habberfield-Short, 2007; Boyd and McGrath, 2001). Some sites seem also to have arisen during the Iron Age yet others demonstrate occupation during the Iron Age and in one case, at Ban Non Wat, to the Neolithic (Higham and Kijngam, 2010). Moore (1989) noted the presence in Cambodia of moated sites comparable to those found in Northeast Thailand and pondered the relationship in these morphologically similar sites.<sup>1</sup> One of the sites Moore references is Lovea (Fig. 1) located in Puok District, Siem Reap Province, first investigated by Mallert (1959). Mallert was informed by locals that human remains and bronze had been uncovered at the site c. 1889 but his own investigations were fruitless (Mallert, 1959).

Lovea was selected for excavation for a joint Authority for the Protection and Management of Angkor and the Region of Siem Reap (APSARA), Australian Research Council (ARC) project aimed at examining the emergence of complex societies in Southeast Asia prior to the rise of the Angkorian state. Our understanding of this crucial period in prehistory has been enhanced by an increasing number of archaeological excavations conducted at Cambodian Iron Age sites in recent years. Research completed attests to a transformative period characterized by increasing socio-political complexity, intensified trade and exchange, differential access to resources, technological transfer and developments in site morphology. The presence of extramural architecture at Lovea, in the form of moats that surround the site is seen as a possible indicator of socio-political change in the region during the Iron Age. Herein we will present the site of Lovea and describe the excavations that were undertaken at the site in 2011/2012.

#### 1.1. Lovea and environs

Currently at Lovea there is a modern village situated atop a low mound that measures 210 m from north to south and 312 m from east to west. Surrounding the mound are two, fragmented, encircling embankments separated by moats. The outer embankment averages about 20 m in width and the moat is between 70 and 50 m wide (the width varies). The inner moat varies in width between 50 and 40 m terminating at the edge of the habitation mound.

The outer embankment of Lovea abuts what is likely a later, Angkorian-era hydrological construction. A rectangular feature 2354 m on the east-

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<sup>1</sup> Circular sites, surrounded by a ditch are known from southeast Cambodia and southwest Vietnam, known as Memotian or Banteay Kou sites. These are morphologically distinct from the sites of northeast Thailand and the few sites found in the Angkor region.

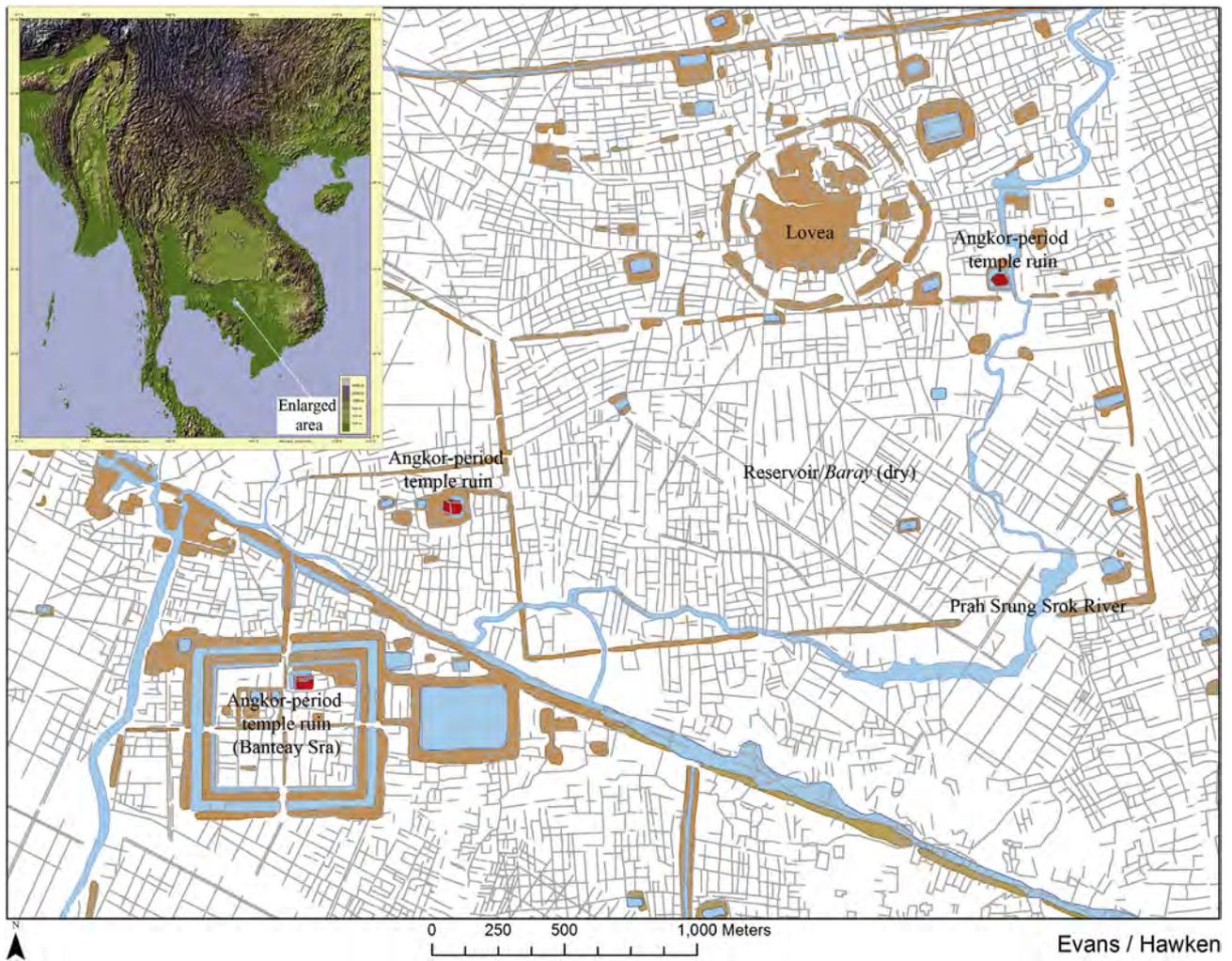


Fig. 1. Map showing site location in Southeast Asia and of the area surrounding Phum Lovea.

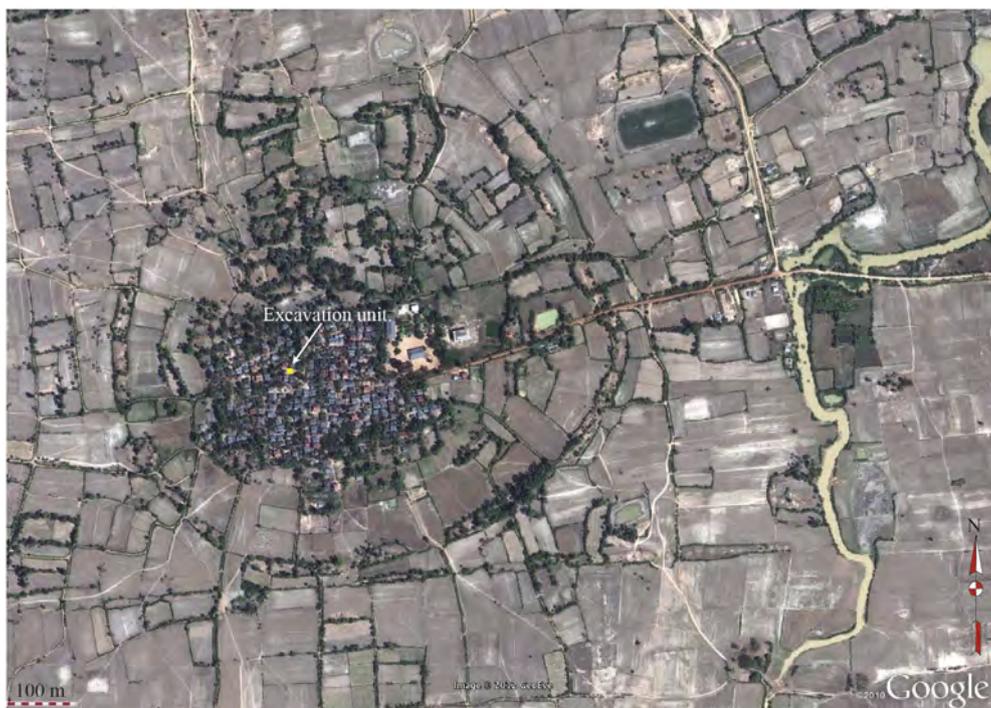


Fig. 2. Aerial view of Lovea from Google Earth (Map data Google, CNES/Atrium 2014).

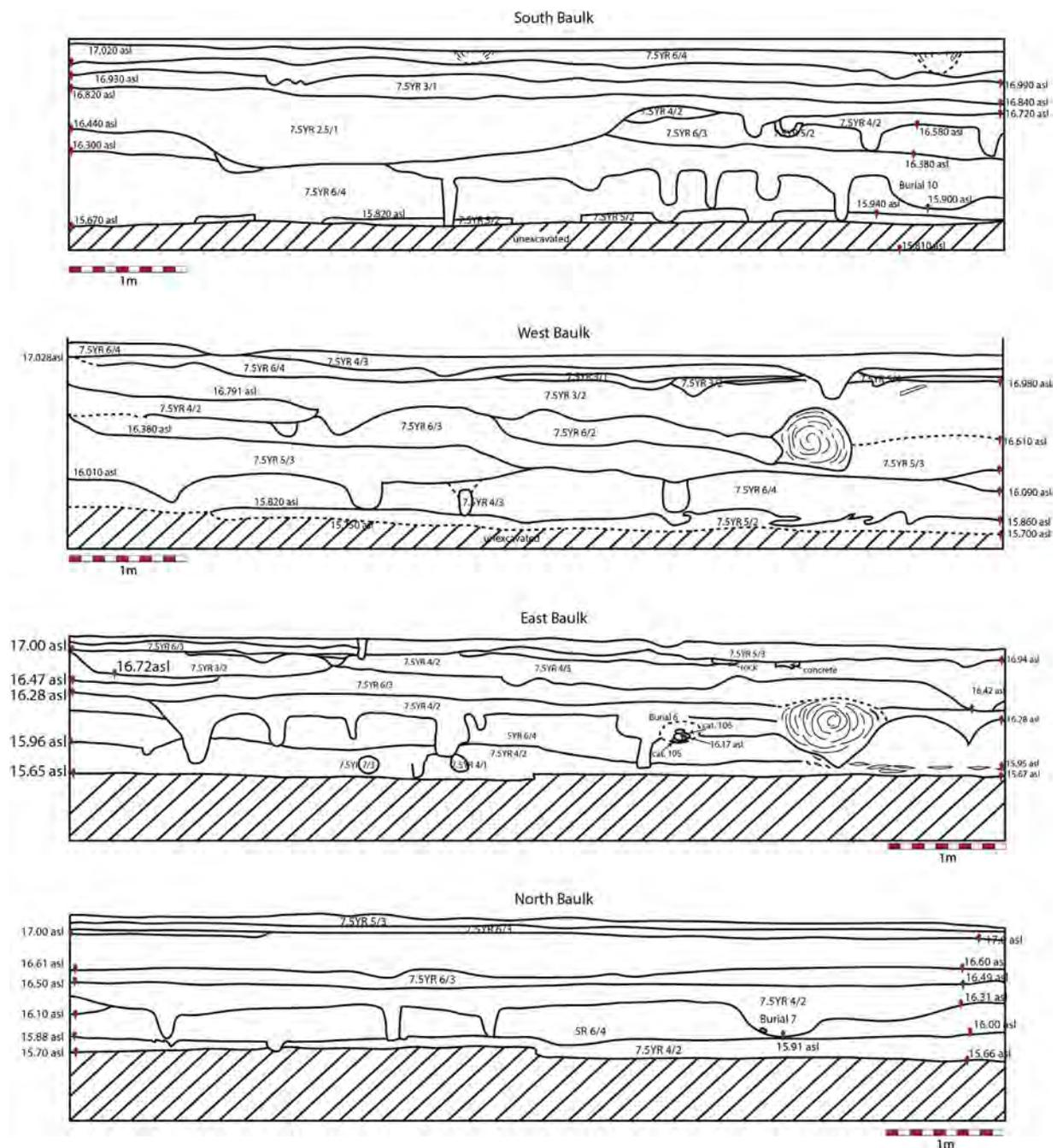


Fig. 3. Illustrations of the baulks at Lovea.

west axis and 1210 m north–south is visible in areal images. It is likely that this represents an historic *baray* or Angkorian reservoir (Hawken, 2011). The landscape around Lovea is dotted with later, Angkor-period monuments, hydraulic and transportation features. The temple of Banteay Sra lies 2.75 km away to the southwest and the temple of Angkor Wat lies 18.35 km to the southeast of the site. Several probable prehistoric mounds and, indeed, other moated sites lie in proximity to Lovea. These sites include; Roka Krom, Roka Leu, Tumreung, Chuk, Chuo Chakrei, Pongro, Romiet, Tonle Sar, Lbaeuk, Sambour, and Kok Cha. The chronological relationship between these sites and Lovea is difficult to judge as none have been excavated. There is a distinct possibility that the aforementioned sites especially those that are surrounded by moats are contemporaneous to Lovea.

Excavations were undertaken at Lovea from December 6, 2011 through January 15, 2012 as part of the Australian Research Council funded project *From Paddy to Pura: The origins of Angkor* (DP110101997). An 8 × 8 m excavation unit was located in a vacant lot near the centre of the village (Fig. 2) and a datum established at the south-west corner of a concrete well in the centre of Lovea (North: 1,491,054.765 East: 360,715.842 Altitude (MSL): 16.925 for the datum). In the first season of excavation, reported here, the aim was to confirm the presence of mortuary and occupation contexts on the mound and to determine the date of the site's use. In the following season of excavation, the subject of a forthcoming report, the excavations on the mound were expanded and the embankments surrounding the site were explored using Ground Penetrating Radar and excavation. The location of the excavation unit was selected opportunistically,

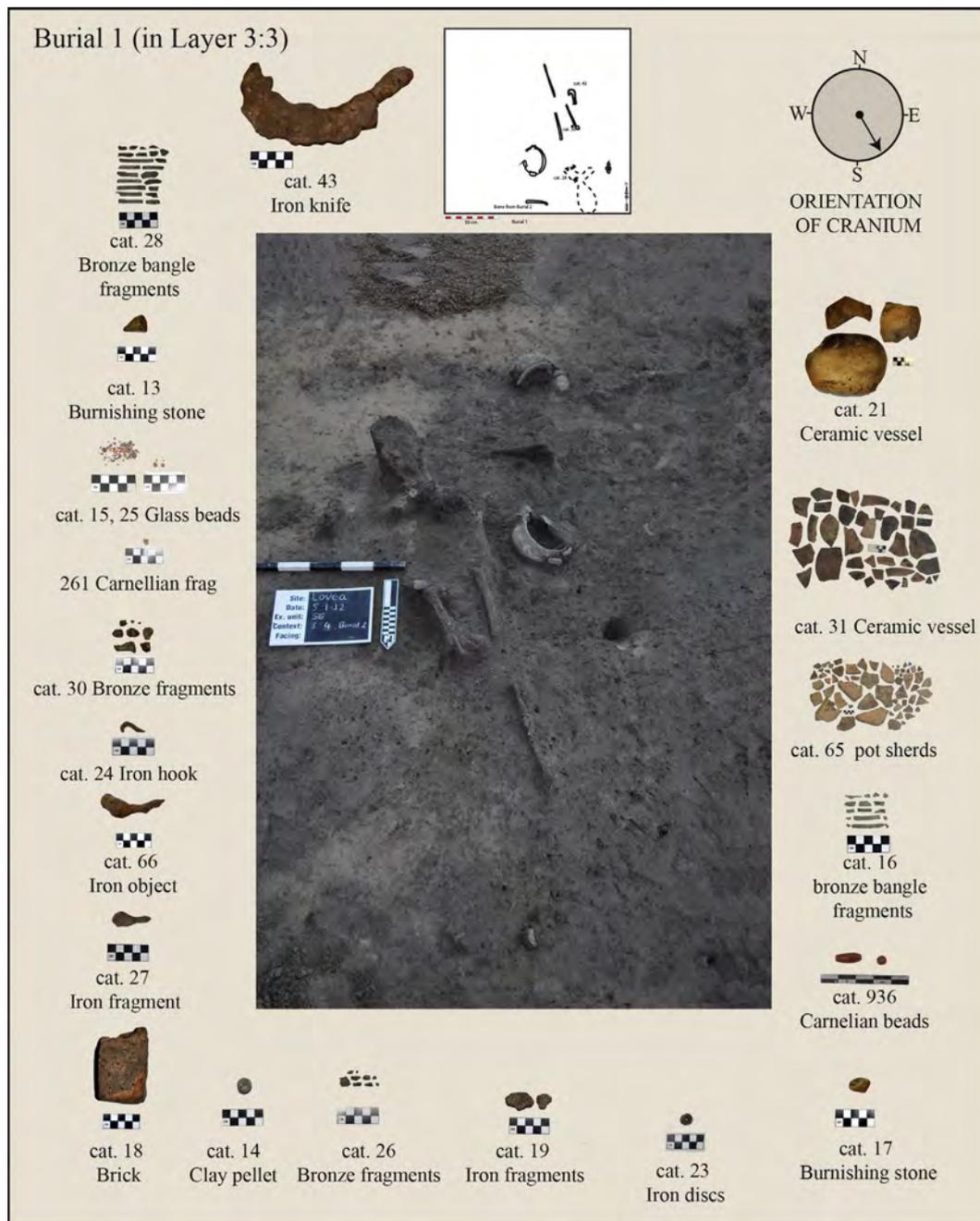


Fig. 4. Burial 1, Lovea.

based on the layout of the modern village and in consultation with the present residents.

## 2. Methods

The site was excavated using arbitrary 10 cm spits and efforts were made to recognize stratigraphic layers that differed in colour. All soil was sieved using a 1 mm screen. The layer number is cited first followed by the spit number e.g. Layer 1, spit 1 is denoted as 1:1. Where features were encountered a distinct, consecutive number provided for these e.g. 1:1 F1. Excavation terminated at c. 1.60 m below surface where natural, non-cultural soil was encountered and the water table met.

## 3. Results

Three layers were identified during the excavation (Fig. 3), the first comprised modern material including porcelain, glass and modern iron artefacts and was stratified with light coloured sand. The soil abruptly turned darker which may, according to local informants, be the result of a napalm attack in the early 1970s. Below this the soil gradually turned to dark grey. In the lower levels of this layer Angkorian sherds were found. Below this a third layer was uncovered which was light orange. In this third layer lay the Prehistoric material including eleven burials. Below the third layer was a hard, dark, compacted layer which represents non-cultural soil.

The first layer comprised two ten cm spits and contained modern artefacts and features of a recent date. Overall the soil was red in colour



Fig. 5. Burial 2, Lovea.

(10YR 5/6). Approximately 20 cm below surface a change in the soil colour was noted and a new layer designated. Layer 1, spit 1 comprised mostly modern, earthenware sherds (86% of the total) with a small proportion of modern, imported porcelain. Spit 2 of Layer one was more varied with 21% of the assemblage comprising porcelain, 39% comprising white earthenware and the remainder plain earthenware (Lim, 2013).

Layer 2 was mostly reddish black (10R 2.5/1) and was c. 40 cm in depth, comprising four excavated spits. The soil colour likely results from the fire-bombing of Lovea during Cambodia's civil war in the 1970s and this was confirmed by soil chemistry analysis. The upper spits of Layer 2 surrendered a substantial quantity of modern ceramics Chinese pot/plate sherds and nails and some earthenware sherds both within features and in the level matrix. Layer 2, spit one was more varied again comprising just under 40% porcelain and a majority of

stonewares (48%) and a small proportion of earthenware sherds (14%). Spit 2 in Layer 2 comprised 54% porcelain sherds, 24% stoneware sherds and 21% earthenware sherds. In 2:3 the ceramics comprised 45% porcelain, .09% stoneware and 45.6% earthenware. The last spit of Layer 2 comprised 60% porcelain, 15% stonewares and 23% earthenware sherds (Lim, 2013). A feature (Feature 2) in the last spit of Layer 2 returned two radiocarbon dates indicating that the feature was excavated c. 1719–1827 AD/1727–1813 AD.

Layer 3 was designated upon recognition of a change in the colour of the overall matrix to a very dark grey (10YR 3/1). In the first spit of Layer 3 a small Angkorian-period carved sandstone head (cat. 2), tentatively dated, stylistically, to the 10th century A.D. was found. It appears that this artefact which measured 3.5 cm × 4.5 cm was likely part of an Angkorian lintel. Twenty centimetres below this point the first grave cuts were recognized and there was an apparent increase in the amount

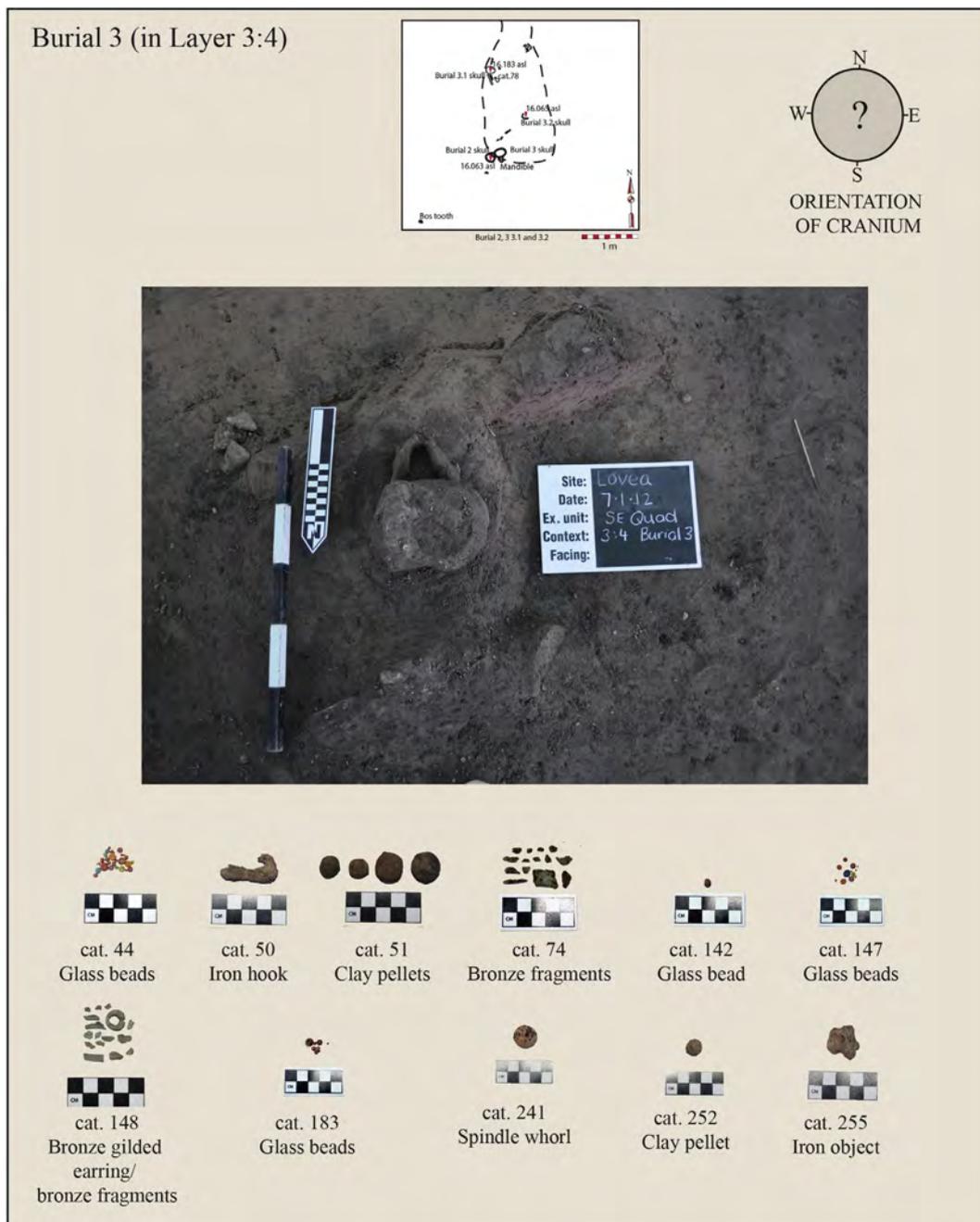
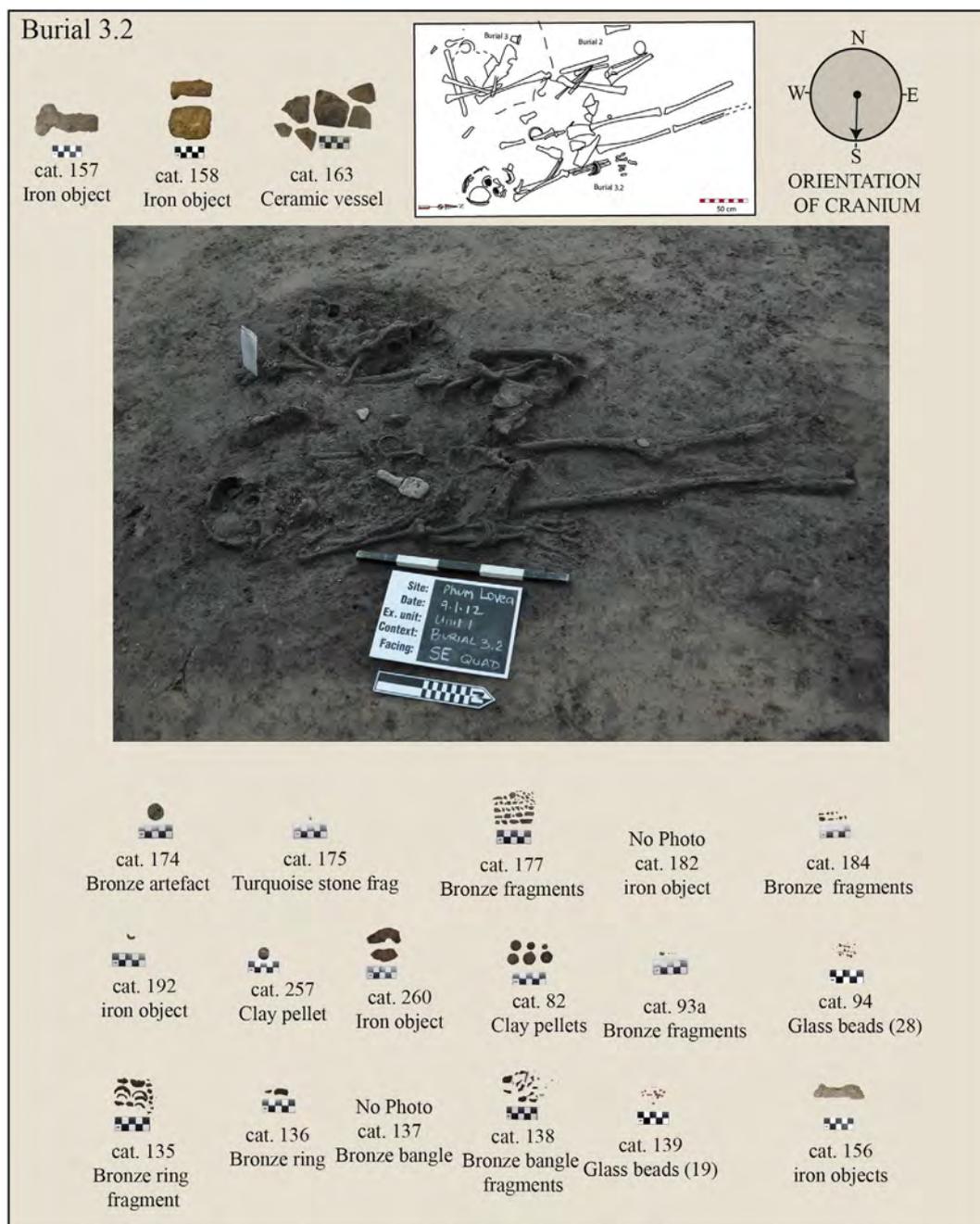


Fig. 6. Burial 3, Lovea.

of earthenware sherds recovered from the matrix. The first spit of Layer 3 did not contain many sherds, just 32, but nearly 70% of these were porcelain. The spit below contained more sherds, a total of 72 made up of porcelain and earthenware, 10 and 90% respectively. In Layer 3, spit 3 98% of the sherds recovered were earthenware with just 3 porcelain sherds found. A similar situation was encountered in spit 4 with 393 sherds found of which 99% were earthenware. Layer 3, spit 5 was unusual in that no sherds were encountered at all but 9 lumps of burnt clay were encountered. The spit beneath this, spit 6 contained 265 of which 91% were earthenware but still 24 fragments of the burnt clay were encountered. Layer 3, spit 7 rendered 119 finds including 5 burnt lumps of clay. The remainder of the finds were earthenware sherds. The deepest spit, 3:8 surrendered 234 earthenware sherds (Lim, 2013).

The first of eleven burials was uncovered c. 90 cm below surface in Unit 1. The deepest burial was initially uncovered at c. 1.40 m below

surface and all are roughly contemporaneous. Burial 1 was discovered in the southeast quadrant of the unit and was very poorly preserved and Burial 2, in an even worse state of preservation, was located just to the south of this. Burials 3, 3.1 and 3.2 were in roughly the same area as Burials 1 and 2. These interments were, again, poorly preserved and rather intermingled. Burial 4 was uncovered in the southwest quadrant of the unit 1.10 m below surface and bone preservation was poor. Burial 5 was located along the northern baulk of the excavated area in the northeast quadrant. The sixth burial was located adjacent to Burial 3.2 near the east baulk in the southeast quadrant. Burial 7 was found c. 30 cm below Burial 5 on the north baulk. Burials 8 and 9 were located below where Burial 4 was found and both were very poorly preserved. Burial 10 was discovered in the southwest corner of the excavated area and Burial 11 was c. 20 cm below Burial 9. Both of these last interments were discovered at c. 1.40 m below surface.



**Fig. 7.** Burial 3.2, Lovea.

The surface of the last spit in Layer 3 was crowded with post holes with no discernible alignment and some larger features. The plethora of post moulds suggests that the area was used for domestic purposes, however, there were very few ceramics in this spit.

For the most part the last spit in Layer 3 (3:9) comprised wet sand as the water table began to seep through in this spit. After another 10 cm was removed and there was a distinct change in the colour of the matrix. The darker area exposed in the eastern portion of the unit was found to cover the entire unit meriting a change in the layer designation. Layer 4:1 was predominantly darker than the preceding layer ranging from brown (7.5YR 4/3) to dark yellowish brown (10YR 4/4). Layer 4:1 was determined to represent the natural deposits underlying the cultural material at Lovea.

The distribution of ceramic sherds in Unit 1 indicates that the area may have been used in a multitude of ways. The upper layers comprise mostly modern materials, probably accumulated in the modern era. Layer 2, comprising a significant amount of Chinese porcelains and stonewares indicates use of the area during the Middle Ages and Angkorian period. The significant amount of Chinese porcelain is of interest indicating involvement in larger trade and exchange networks. The third layer sees a steady decrease in these exotic sherds and stonewares, the latter which were locally produced and by Layer 3, spit 5 a change in the use of the area to one that appears to have been industrial with the appearance of lumps of burnt clay. It is impossible to ascertain what type of activity was undertaken based on the archaeological context. The spits below this indicate a return to probable domestic rubbish deposits with an increase in earthenware sherds from varied vessels.

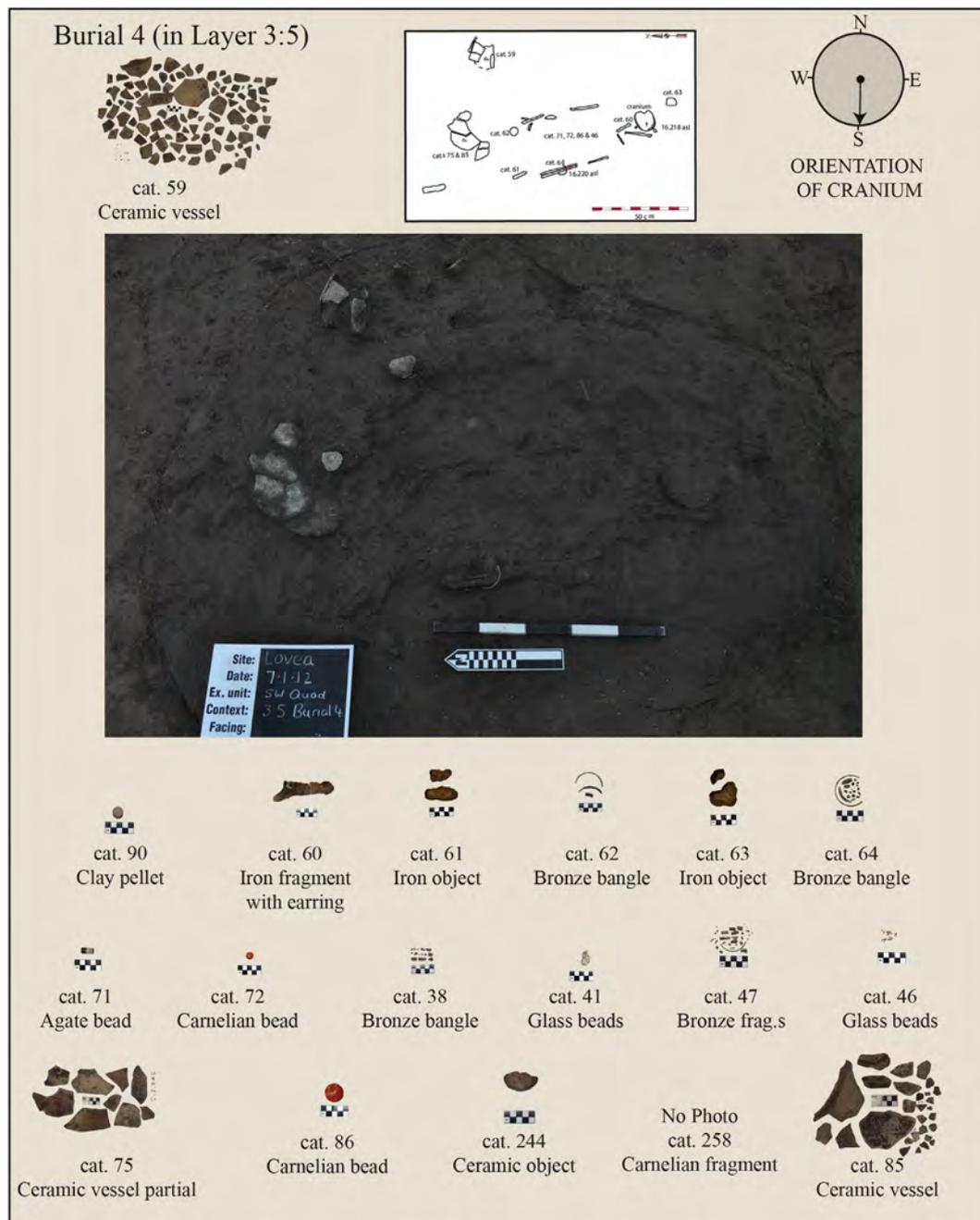


Fig. 8. Burial 4, Lovea.

### 3.1. The burials

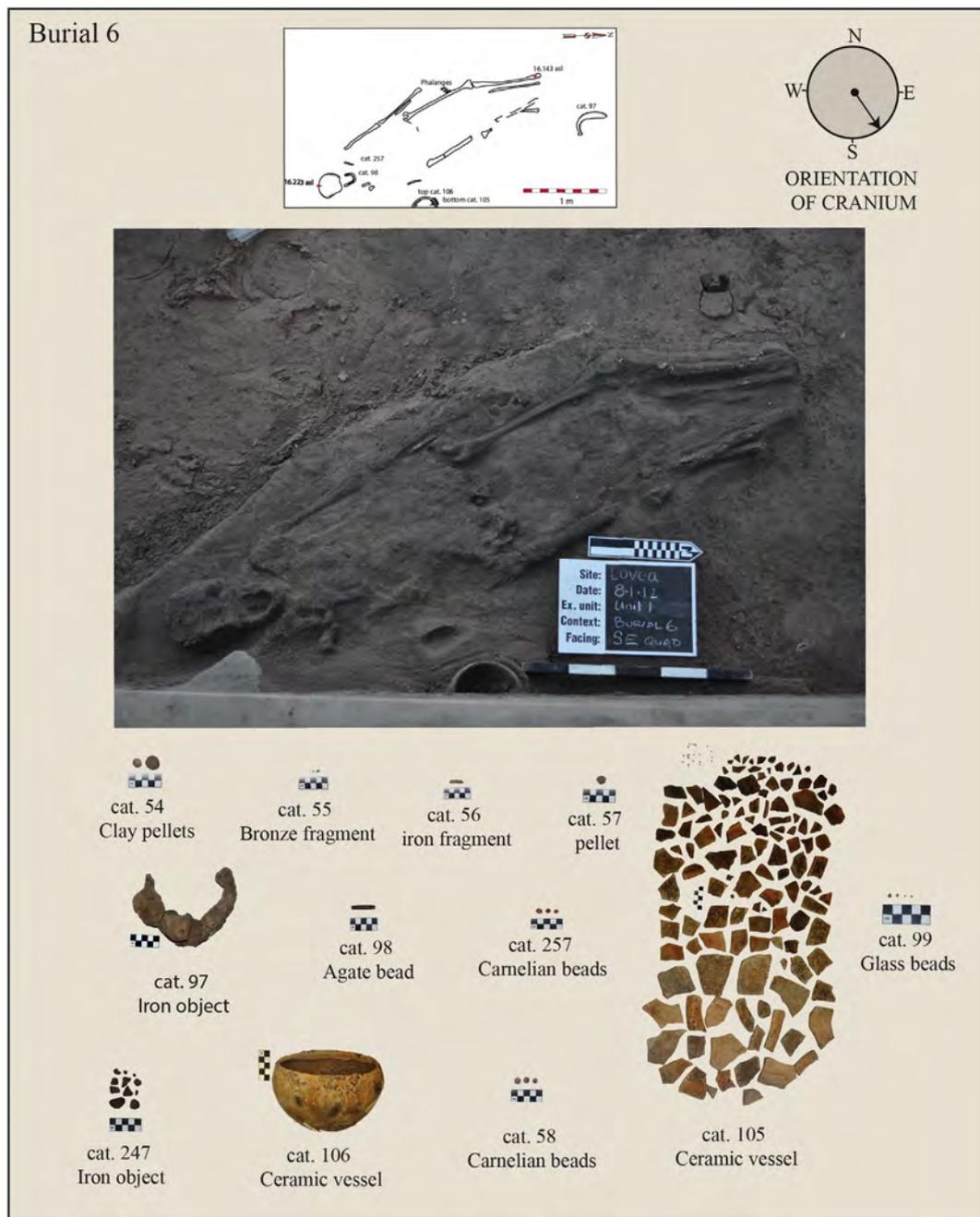
The excavated area at Lovea contained eleven mortuary contexts all of which date to the Prehistoric period based upon the grave goods discovered in association with the human remains.

Burial 1 (Fig. 4) was identified in an area of darker soil in Layer 3:3. This burial consisted only of an outline of a cranial vault and three long bones, possibly belonging to the lower limb (a left and right femora and a left tibia). These bones were undisturbed and appeared in the correct anatomical location. Based on the size of the bones this individual was an adult. The alignment of the skeletal material indicated the individual lay in a north–south orientation with the cranium southward.

Twenty catalogued artefacts were found in association with the burial including bronze bangle fragments, two possible

burnishing stones for ceramic vessel decoration, Indo-pacific glass beads of various colours, two carnelian beads, one bi-conical, the other round assorted bronze fragments, a small iron hook, unidentified iron objects, a brick fragment, small iron discs, a clay pellet, an iron knife and the remains of three ceramic, earthenware vessels.

Burial 2, (Fig. 5), like Burial 1, was very poorly preserved and was represented by a cranium and a jumble of post-cranial bones to the west of Burial 3.2's pelvis (see below). It is likely that the burial was disturbed in prehistory. The burial was located to the west of Burial 1 in the southeast quadrant of the unit in Layer 3:4. All that remained of the bone was a partial femur, a possible humerus, a phalange and parts of a cranium. The matrix surrounding the human remains contained one ceramic vessel, fragmented, Indo-pacific glass beads, two clay pellets, three iron objects some bronze



**Fig. 9.** Burial 6, Lovea.

fragments a bronze ring and what are believed to be two bronze rings.

Near Burial 2 another human cranium was uncovered and labelled as Burial 3 (Fig. 6). The skull was very poorly preserved but a number of artefacts were found in association with the human remains including glass beads, an iron hook, four clay pellets, bronze fragments, an iron object and a bronze earring with gold gild and bronze fragments. The remains are likely those of an adult male (Domett pers. comm.) It appears likely that the post-cranial remains of Burial 3 lay to the west of the skull labelled as Burial 3.2 (see below).

Burial 3.1 was found to the north of Burial 3 and was represented by an adult human cranium of indeterminate sex (Domett pers. comm.) There were no post-cranial remains associated with the skull and no artefacts could be identified as belonging to this burial.

To the south of this cranium and adjacent to Burial 2 another interment was discovered, this one being more intact than the others in the same area. Burial 3.1 was represented by both cranial and post-cranial human remains. It is likely that the jumbled remains of Burials 2, 3 and 3.1 are the result of the excavation of the grave for Burial 3.2 which must have occurred at some point after the individuals in Burials 2, 3 and 3.1 were interred.

Burial 3.2 (Fig. 7), the grave of a young, adult male (Domett pers. comm.) contained a range of material culture including several iron objects, some ceramic sherds, unidentified bronze artefacts, a small fragment of turquoise stone, bronze fragments, seven clay pellets, Indo-pacific glass beads of various colours, fragments of bronze ring, a bronze ring, bronze bangle and fragments of a bronze bangle.

This series of burial numbers (2, 3, 3.1 and 3.2) was assigned as a mixture of partially disturbed and partially articulated human remains

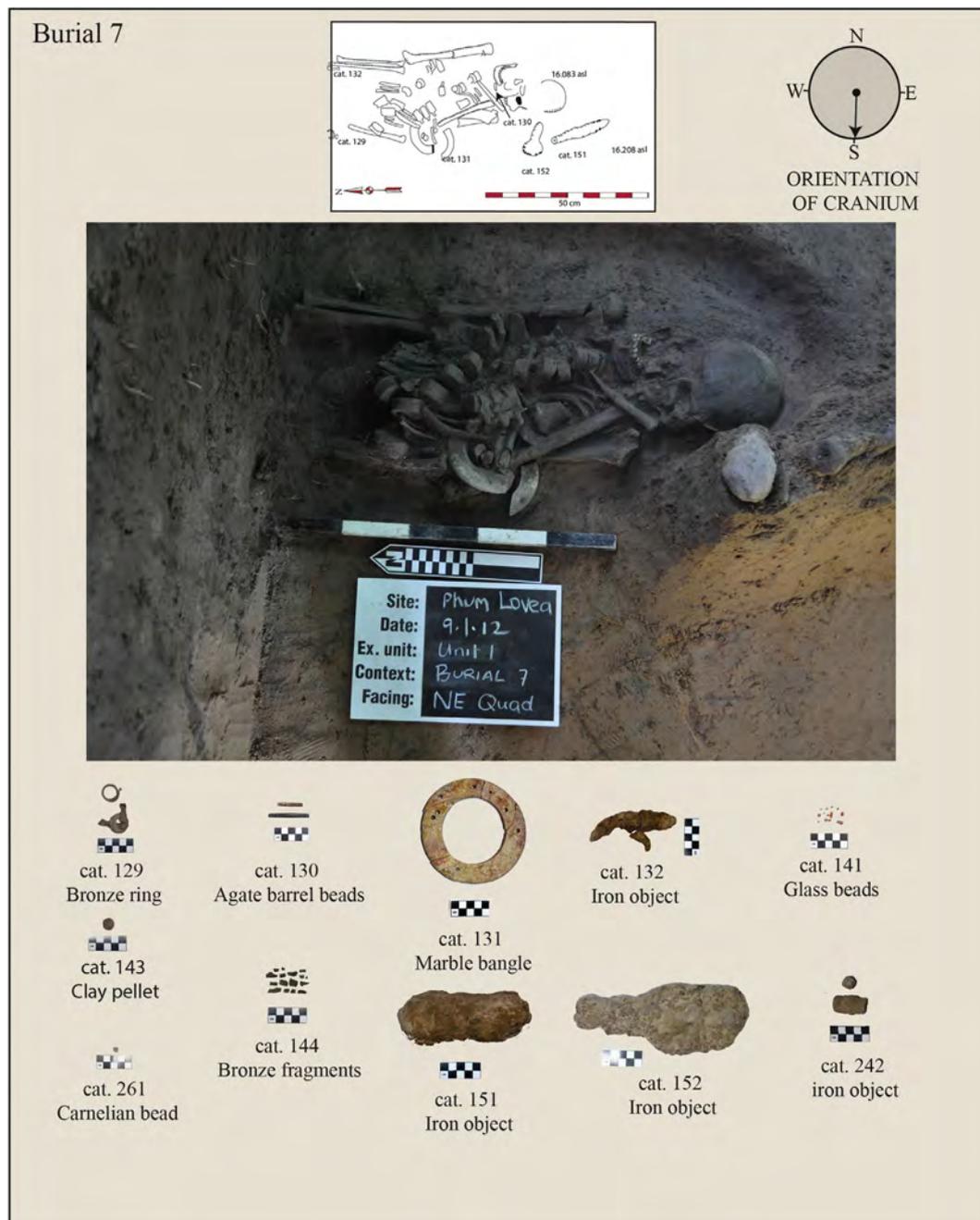


Fig. 10. Burial 7, Lovea.

was discovered in a very discrete area. Burial numbers were assigned based on the presence of cranial material. At this preliminary stage, Burial 2 consisted of a mandible, partial skull and disturbed lower limb bones in between Burial 3.2 and Burial 3. Burial 3 consists of a partial skull and disturbed upper and lower limb bones. Burial 3.1 consists of a skull near the lower limbs of Burial 2 and 3.2. Burial 3.2 is represented by the near complete and articulated skeleton. It is possible that at least 4 individuals are represented by these remains. All the remains were adult.

Burial 4 (Fig. 8) was uncovered in Layer 3:5 in the southwest quadrant of the unit. The top of the cranium was 1.04 m below the ground surface. The bone preservation was very poor. This burial only consists of bone fragments possibly some right forearm bones and some lower limb bones. These remains are possibly from an adult.

The burial was associated with the fragmentary remains of three ceramic vessels, a clay pellet, iron objects an iron fragment found below the skull with a bronze, gilded earring adhering to it, bronze bangles, mostly fragmentary, Indo-pacific glass beads, an agate bead, a spherical carnelian bead, a large disc-shaped carnelian bead, an unidentified ceramic object and a fragment of carnelian bead.

In excavating 3:4 F2, a dark stained area, a single juvenile long bone in very fragile condition and a calcaneus was uncovered. This was labelled as Burial 5. No other bone was found. It is unclear whether the remains represent an adult or subadult. The only material culture found was an iron object.

Burial 6 (Fig. 9) was uncovered along the east baulk of the unit. The top of the cranium was 93 cm below the ground surface. The head was orientated in a south-southwesterly direction as was Burial 3.2 to the west of it.

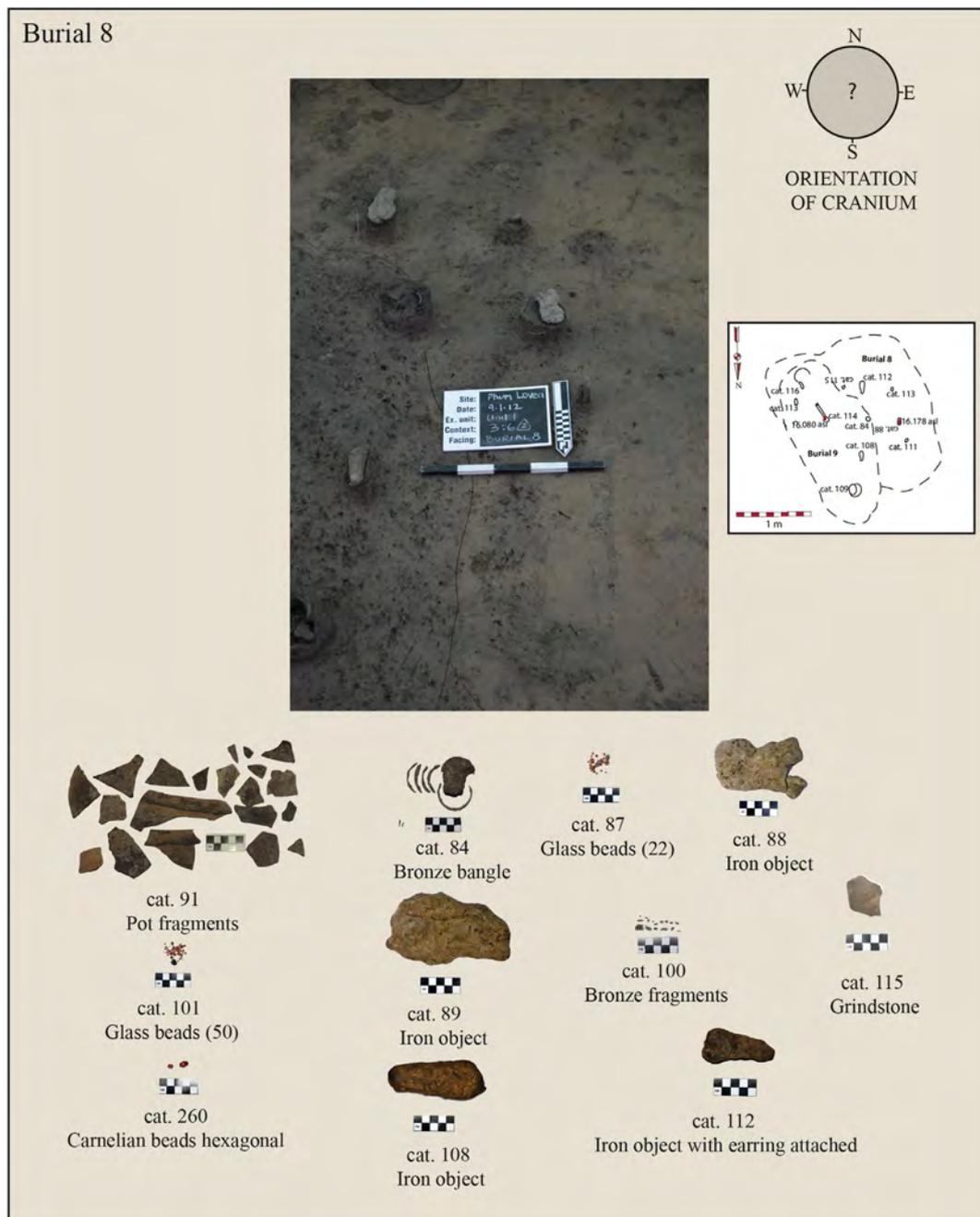


Fig. 11. Burial 8, Lovea.

The bone was very poorly preserved, comprising a cranium, mandible and partial long bones. The material culture found in association with this burial included three clay pellets, some bronze fragments, an iron fragments, a curved iron implement, spherical carnelian beads, a tubular agate bead, four fragmentary glass beads and two ceramic vessels, one atop the other in the east baulk.

Burial 7 (Fig. 10) was discovered in the northeast quadrant and most of the burial, from the below the top of the pelvis is located in the northern baulk. The bone was fairly well preserved in this mortuary context and it is clear that this is an adult. The top of the cranium was 1.05 m below the ground surface. The portion of the grave that was exposed contained bronze rings, two agate tubular beads, a marble bangle that had drill holes in it, evidence of repair in prehistory, unidentifiable iron objects, Indo-pacific seed beads, a clay pellet, fragments of bronze, two carnelian barrel beads and two iron tools

found above the head. Burial 7 contained a carbon sample adhering to one of the iron tools which returned a date of 137–340 calAD at 94.5% probability.

In the SW Quad 3:6 F2 was an area of dark staining but revealed only a small piece of ulna inside a bronze bangle. Based on the limited bone recovered it was possible to determine this to be an adult (Domett pers. comm.). It was accordingly labelled as Burial 8 (Fig. 11). Material culture was found arrayed around where a skeleton would likely have been including ceramic fragments, bronze bangle fragments, Indo-pacific glass beads, two hexagonal carnelian beads, a sandstone grindstone, three iron objects and an iron object found near where the skull would have been with a bronze earring adhering to it.

Like Burial 8, to the west, Burial 9 (Fig. 12) had very poor bone preservation but it may represent an adult, probably a male (Domett

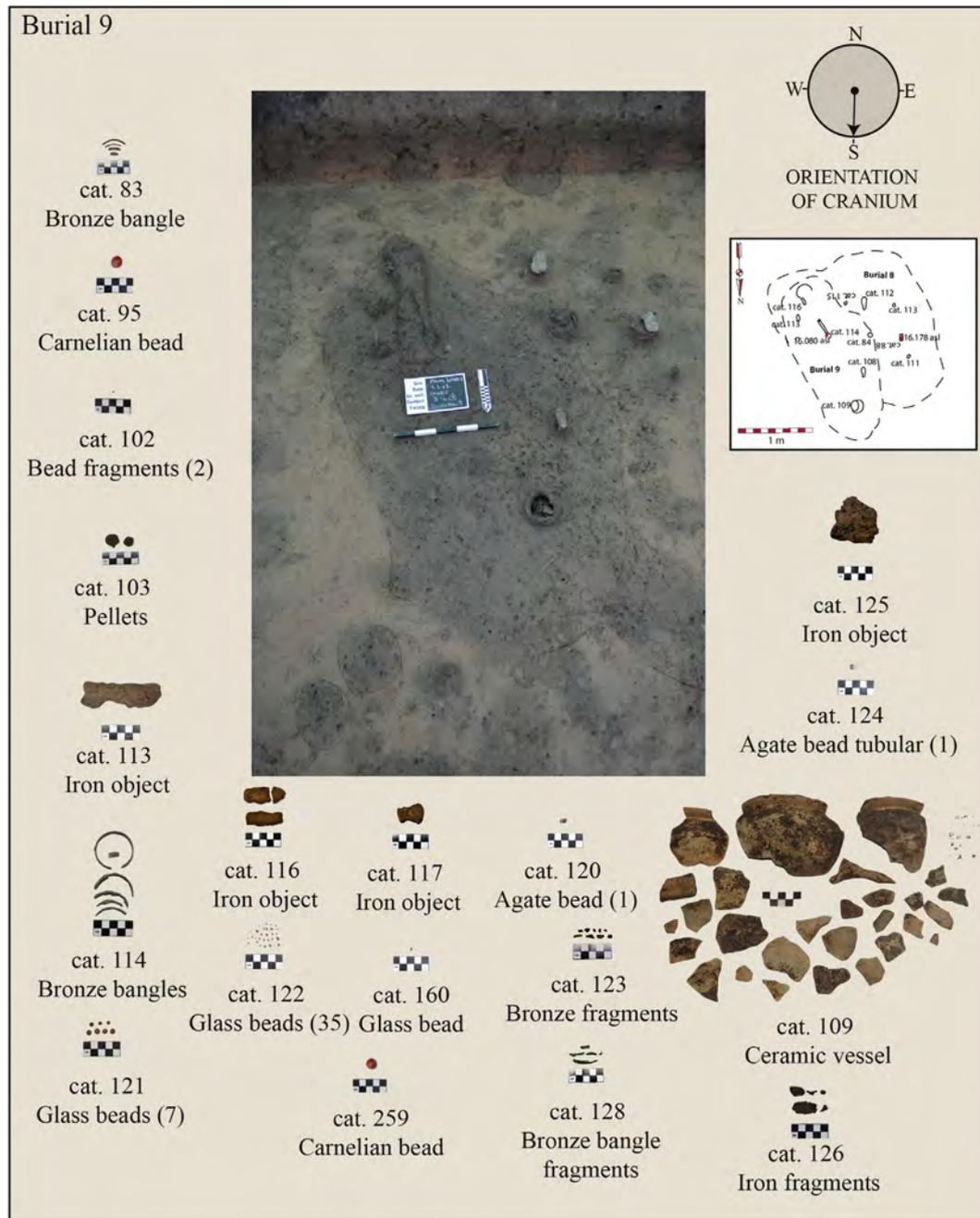


Fig. 12. Burial 9, Lovea.

pers. comm.). There were some fragments of humerus and tiny flecks remaining of the cranium. A range of artefacts were found in association with the burial including an iron object beneath the area where the skull would have been. Other finds from near the cranium included a spherical carnelian bead and some glass Indo-pacific beads. There were four unidentified iron objects in the vicinity of the burial and an agate bead, a carnelian bead and a ceramic vessel.

Burial 10 (Fig. 13) was discovered in the SW corner of the SW quadrant. The burial had a great deal of concretion present which made it very difficult to excavate. In terms of bone preservation, Burial 10 was slightly better preserved than many other burials with many parts of the upper and lower limbs present, with the exception of the left tibia and fibula. The bone also fragmented during lifting as it was very fragile. The remains are definitely from an adult individual, probably male (Domett pers. comm.).

The material culture in Burial 10 included the remains of three ceramic vessels, Indo-pacific glass beads, iron tools, clay pellets, bronze bangle fragments and a probable fragment of a sandstone grindstone.

Burial 11 (Fig. 14) was discovered beneath the area where Burial 9 was located. The bone of this adult was in very poor condition and consists of an upper skeleton only, from the skull to approximately the mid-femora level. The skull was highly fragmented and incomplete. The remains belong to an adult individual.

A curved iron knife was found in the area of the pelvis just below a bronze bangle on the left arm and fragments of bronze bangle were found nearby. A bronze ring was found on the right of the burial in the area where the hand should be. A small bronze disc was recovered from the thoracic area and four Indo-Pacific glass seed beads.

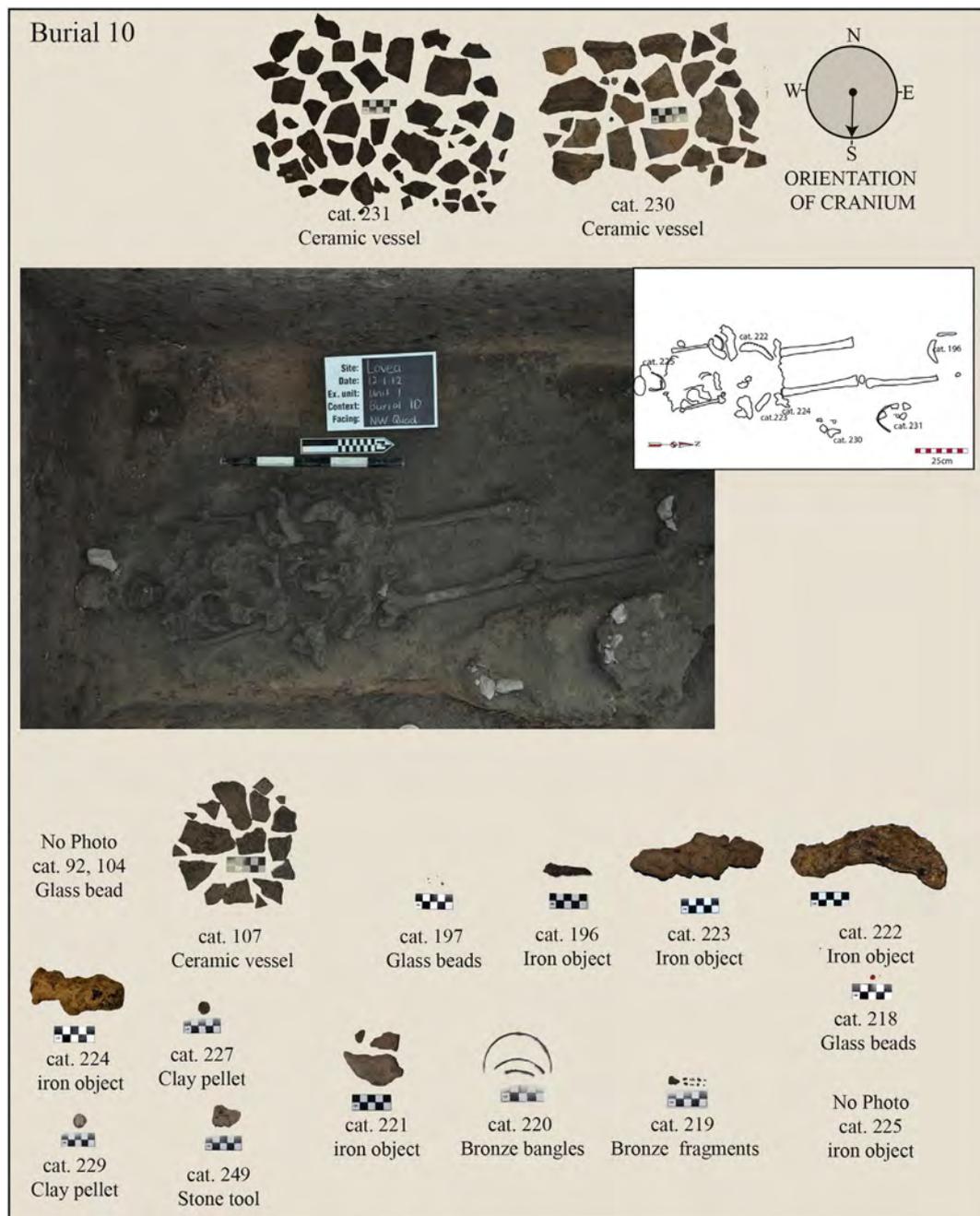


Fig. 13. Burial 10, Lovea.

A radiocarbon sample of associated charcoal from burial 11 returned a date of  $1775 \pm 40$  BP (132–353 calAD) with a 95.4% probability.

### 3.2. Radiocarbon determinations

The cultural sequence at Lovea appears to be rather constrained with no evidence for occupation at the site prior to the Iron Age (c. 500 BC–AD 500). Table 1 shows the radiocarbon determinations for Unit 1. All of the samples submitted for dating were charcoal from in situ contexts. It has not been possible to rule out in-built age for these samples but there was little option in terms of dating the site. Dating was undertaken at the ANU Radiocarbon Dating Centre, Australia. Of the two dates recovered from Burial 7, one is deemed to be aberrant as it is considerably earlier than the other dates from burial contexts. Based on the material culture and the fact that another C14 sample (#29327) from

Burial 7 rendered a more reasonable result it is suggested that sample #28426 should be seen as an outlier.

The dates above are somewhat corroborated by the discovery of a bronze coin in Burial 11 (see Fig. 15). The coin has a very thick lip and an apparent square whole in its centre but no evidence of any characters. The piece bears some resemblance to a coin held in the Fitzwilliam museum (CM.522–2000) in the United Kingdom. The Fitzwilliam coin is attributed to the Wang Mang period c. AD 7–23. Coins of this period have been found in Sa Huynh period burials in Vietnam (Lam, 2009) and a very similar, Xin dynasty (c. 9–23 AD) coins are held by the Musée Guimet in Paris from an interment in Thung Thôn, Thanh Hó, Vietnam (MG 23145 and ET 23166). It is impossible to say that the coin was placed in the grave at this time but its presence does provide a terminus ante quem for the burial if the identification is accurate.

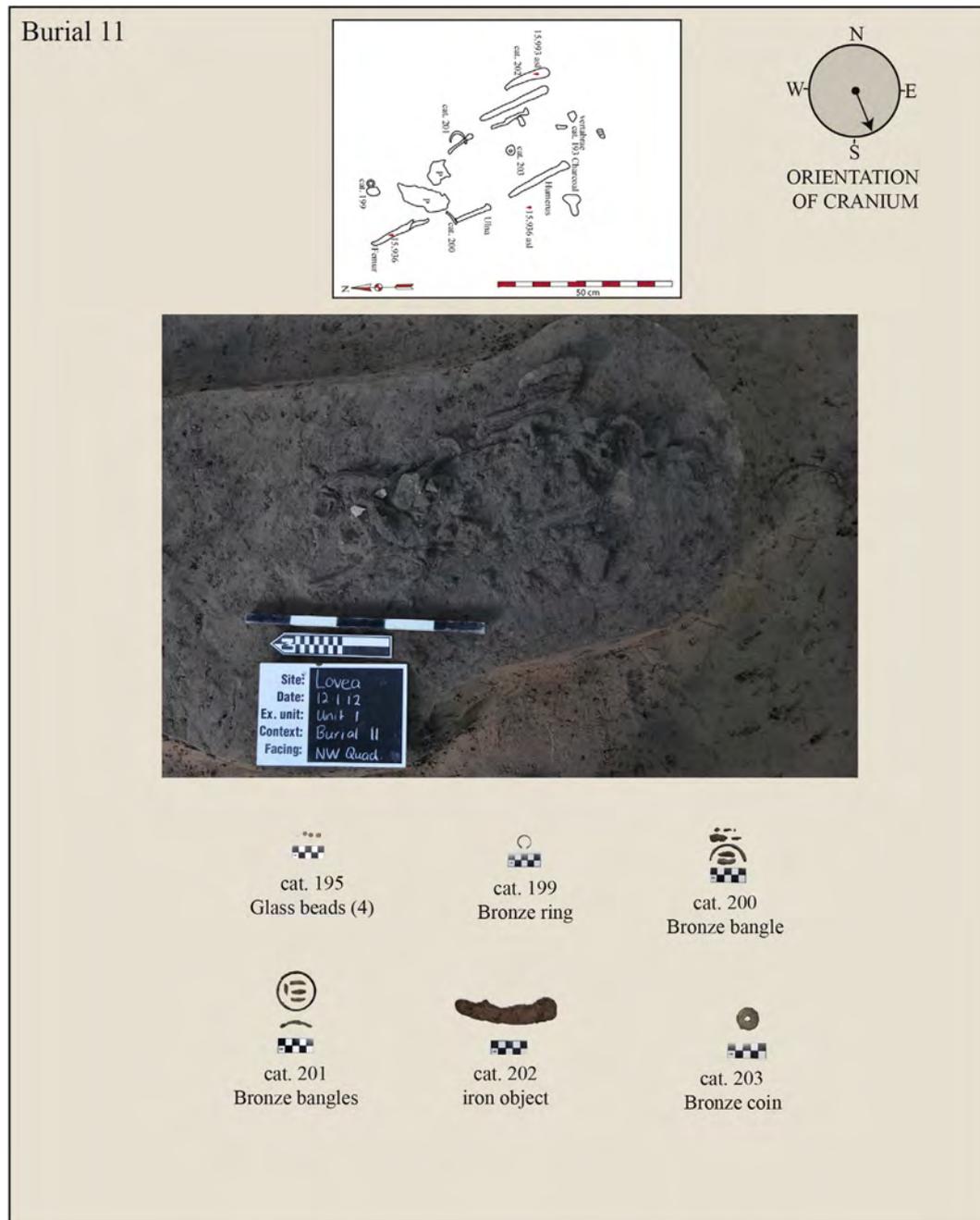


Fig. 14. Burial 11, Lovea.

**Table 1**  
Radiocarbon determinations from Lovea.

S-ANU#	Provenience	$\delta^{13}\text{C}$	$\pm$	Percent Modern Carbon (pMC)	$\pm$	$^{14}\text{C}$ age	$\pm$	OxCal	Probability
28606	Layer 3 surface of spit 3	-28.7393	0.39	81.807	0.21	1615	30	387–539 AD	95.4
28425	Layer 3 surf. spit 8	-25	2	80.089	0.384	1785	40	128–346 AD	95.4
28426	Burial 7	-25	2	64.994	0.36	3460	45	1895–1665 BC	95.4
28427	Lay. 3 spit 8, Feature 2	-25	2	80.379	0.389	1755	40	209–390 AD	87.3
28429	Lay. 1 spit 2	-25	2	131.531	0.578	>MODERN			
28430	Lay. 3 spit 7 Feature 3	-25	2	78.689	0.376	1925	40	3 BC–141 AD	88.1
28431	Burial 11	-25	2	80.162	0.396	1775	40	132–353 AD	93.5
28432	Lay.2 Spit 4 Feature 2	-25	2	97.808	0.488	180	45	1719–1827 AD	46
28433	Lay.2 Spit 4 Feature 2	-25	2	97.261	0.468	225	40	1727–1813 AD	41.3
29326	Lay.4 surface spit 1	-31.82936	2	82.387	0.226	1555	30	425–571 AD	95.4
29327	Burial 7 (adhering cat 152)	-31.70149	2	80.172	0.219	1775	30	137–340 AD	95.4
35535	Lay. 3 Spit 5 Feature 2	-30	2	79.4	0.26	1855	30	82–234 AD	95.4
35536	Lay. 3 Spit 8 Feature 1	-28.56393	2	79.86	0.29	1805	30	129–325 AD	95.4



Fig. 15. Coin discovered in Burial 11, Lovea.

#### 4. Conclusion

The 2011/2012 season at Lovea revealed a total of 11 mortuary contexts that, based on the associated material culture, likely date to the late Iron Age (c. A.D. 100–500). Given the interments are situated just above the natural soil it appears that the human remains represent the first occupants of the site. The dead were interred with a range of material culture that survived the taphonomic processes including ceramic vessels, iron tools, bronze jewellery, stone and glass beads and a clearly imported item, a Chinese coin. Preservation of the bone was poor but it appears that a range of ages from young to old adult are represented and seven of the burials may represent the remains of males while the others were unidentifiable to sex (Domett pers. comm.). Very little faunal material was recovered during the excavation most likely due to the acidity of the soil and frequent episodes of flooding in recent times. The layers above the mortuary levels at Lovea rendered artefacts consistent with an Angkor period occupation of the site including iron-glazed brown wares and a 10th century sculptural element. Atop the Angkorian period layers lay recent historic material. Analysis of the material culture and human remains is currently underway and it is hoped that analysis of the ceramics may lead to a more refined periodization of deposit and allow a broad comparison with sites of a similar age in the region.

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