

Phum Lovea: A moated precursor to the *pura* of Cambodia? Sociopolitical transformation from Iron Age settlements to early state society

Dougald O'Reilly and Louise Shewan

The understanding of Angkorian pre-state society has been greatly enhanced by an increase in archaeological investigation in recent years. From excavations conducted at Cambodian Iron Age sites we have evidence that attests to a transformative period characterised by increasing sociopolitical complexity, intensified inter- and trans-regional mercantile activity, differential access to resources, social conflict, technological transfer and developments in site morphology. Among the growing corpus of Iron Age sites excavated, Phum Lovea, on the periphery of Angkor, is uniquely placed to provide insight into increasing sociopolitical complexity in this area. The site is one of the few prehistoric moated settlements known in Cambodia and the only one to date to have been excavated. Excavation of the site has revealed an Iron Age agrarian settlement whose occupants engaged in trade and exchange networks, craft specialisation, metal production, and emergent water management strategies. These attributes can be seen as antecedent to the profound developments that characterise the first millennium CE polity centred on Angkor.

The origins of state-level society can be found in the antecedent Iron Age cultures of mainland Southeast Asia. There exists continuity in the developments from the prehistoric period through to the historic period and ensuing statehood, a transition

Dougald O'Reilly is Senior Lecturer at the Department of Archaeology and Anthropology, the Australian National University, Canberra. Louise Shewan is a Research Fellow for the Monash Warwick Alliance and The Centre for Archaeology and Ancient History, at Monash University, Melbourne. Correspondence in connection with this article should be addressed to: dougald.oreilly@anu.edu.au. The authors would like to gratefully acknowledge the participation of the people of Phum Lovea, Phum Sophy and Phum Snay, the Ministry of Culture and Fine Arts, Cambodia and the APSARA Authority and for their generous support and cooperation including H.E. Bun Narith, H.E. Ros Borath, Madame Mao Loà, and especially our close collaborators, H.E. Dr Tan Boun Suy, Dr Tin Tina, Mr An Sopheap, Mr Kim Samnang, Mr Im Sokrithy, Dr Ea Darith and Mr Chhay Rachana. Also to Mr Tho Thon and Mr Sieng Rosath both of whom made an invaluable contribution to this effort. We also thank the Australian Research Council for supporting the research through the Discovery Grants programme (DP110101997). Thanks also to our colleagues in the field, Mr Suy Pov and Tse Siang Lim and to all volunteers and students. Thanks also to the staff of the Robert Christie Research Centre, especially So Malay, for their support. We are also grateful to the anonymous peer reviewers, and Miriam Stark and Stephen Murphy for comments on earlier drafts. Unless otherwise indicated, all maps and images are copyright Dougald O'Reilly.

bridged by archaeological research and later by temple structures, urban foundations (*pura*) and written inscriptions. In recent years the pace of archaeological research in Cambodia has accelerated, providing a deeper understanding of the cultural developments witnessed in mainland Southeast Asia. The prehistoric cultural assemblage discovered through the excavation of Iron Age sites in Cambodia provides evidence for increasing sociopolitical complexity and innovations that can be viewed as precursors to the profound cultural transformations that characterise later first millennium CE polities in the region.

This article reviews the findings of the recent archaeological research at Phum Lovea and that from contemporary Iron Age sites in Cambodia. Archaeological investigation comprises the excavation of residential and mortuary contexts, the analysis of cultural and human remains and the examination of site morphology and associated extramural features. The sites will be placed in a regional context so as to elucidate variation in the degree of complexity and pace of development and to highlight areas of cultural continuity and divergence. Phum Lovea is unique among these sites to be discussed as its distinct morphology brings to mind the moated sites of the Mun River Basin (Higham, this vol.). The discussion will be divided thematically into those focus areas that can be viewed as catalysts for the burgeoning sociopolitical complexity witnessed in early state mainland Southeast Asian society. It is argued that broadening trans and inter-regional exchange, technological transfer and economic advancement, differential access to resources and increased competition provided the stimuli and momentum to effect transformational change.

The excavation of Phum Lovea

Phum Lovea is located in Puok district, Siem Reap province (fig. 1), north of the Tonlé Sap lake in central Cambodia.¹ It is situated to the west of the West Baray, a large anthropogenic reservoir near Angkor probably first created by Suryavarman I (c. eleventh century CE) and completed by his successor Udayadityavarman II.² The site comprises a low mounded settlement surrounded by two circular moats and embankments. There exists a modern village atop the low mound at Phum Lovea that measures c.210 m from north to south and 312 m from east to west.

Excavations were undertaken over two seasons as part of the Australian Research Council-funded project 'From Paddy to Pura; the origins of Angkor'. The excavated portion of the prehistoric cemetery at Phum Lovea comprises 12 burials dating to the Iron Age (dating to c.130–350 CE). These burials appear to be contemporaneous with occupation on the mound as evidenced by post moulds and debris associated with everyday life. Analysis of the stratigraphy and archaeological deposits indicate that occupation continued in the area after its use as a cemetery. Approximately five hundred years after the dead were interred at Phum Lovea, the state of Angkor was established atop the Kulen Mountains in c.802 CE by Jayavarman II, ushering in an era of monumental construction and hydro-engineering in the region.³

1 Lovea is located at latitude 103° 42' 47.0" and longitude 13° 29' 04.4".

2 Michael Coe, *Angkor and the Khmer civilization* (London: Thames and Hudson, 2005).

3 Charles Higham, *The civilisation of Angkor* (Los Angeles: University of California Press, 2002); Dougal O'Reilly, *Early civilizations of Southeast Asia* (Lanham: Alta Mira, 2007); Mary Beth Day

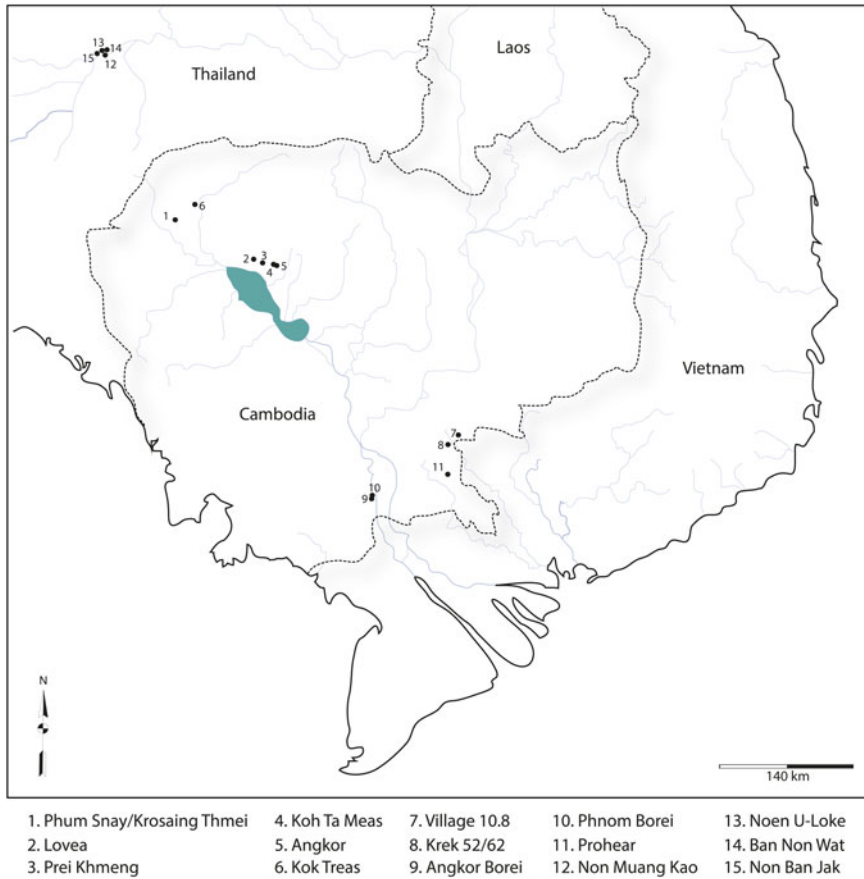


Figure 1. Map showing sites mentioned in the text

Phum Lovea has long been of archaeological interest since first noted by Louis Malleret of the *École Française d'Extrême-Orient* who observed that two embankments enclosed the village (fig. 2).⁴ Malleret noted that the outer embankment of Phum Lovea was interrupted by the Prah Srung Srok River, which has altered its course since the French report was written as it is some 350 m to the east today. There is considerable evidence in the landscape around Phum Lovea of later, Angkor and post-Angkor era activity revealing a long antiquity of habitation in the area. To the south of Phum Lovea there exists a sizeable (700 m by 644 m) Angkorian-era, rectangular, moated site known as Banteay Sra. This temple, orientated east–west was mapped in detail by Christophe Pottier (site register: IK653, CP89).⁵ The enclosure has an associated pond or *trapeang* (340 m by 240 m) to

et al., 'Paleoenvironmental history of the West Baray, Angkor (Cambodia)', *Proceedings of the National Academy of Sciences* 109, 4 (2014): 1046–51.

4 Louis Malleret, 'Ouvrages circulaires en terre dan l'Indochine méridionale', *BEFEO* 49, 2 (1959): 409–35.

5 Christophe Pottier, 'Carte archéologique de la Région d'Angkor. Zone Sud' (Ph.D. diss., Université Paris III, Sorbonne Nouvelle, 1999).

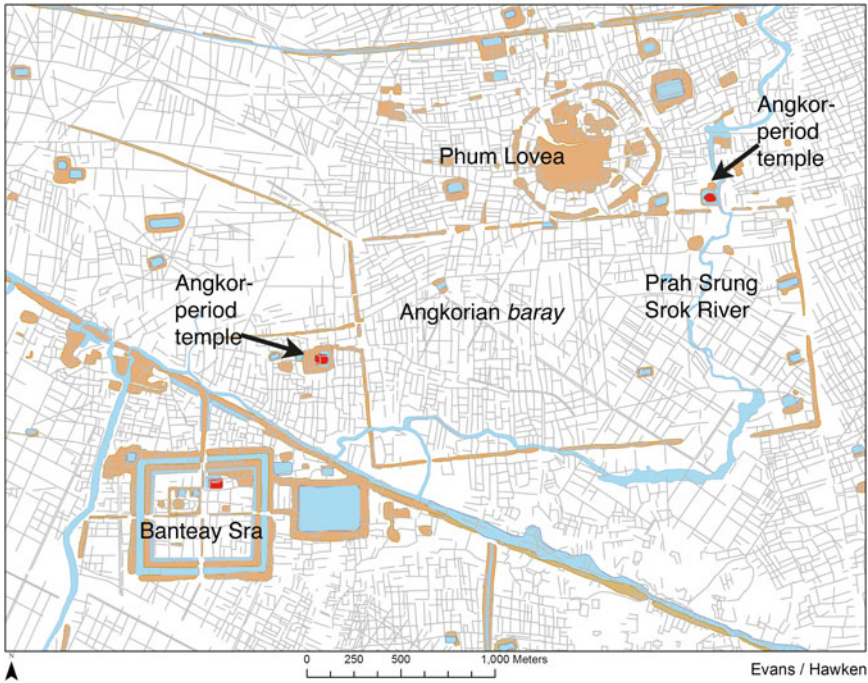


Figure 2. Map of Lovea and surrounds (©Damian Evans and Scott Hawken 2014)

the east. The southern, outer embankment of Phum Lovea abuts a rectangular feature measuring 2,354 m on the east–west axis and 1,210 m north–south, dubbed the Lovea *baray*.⁶ It is likely that this is an historic, post-Angkor feature.⁷ The southwest corner of the *baray* has been disturbed by the construction of the Phokeethra Country Club, during which a tenth-century laterite bridge was uncovered. Known as the Ruloh Bridge it would have spanned a watercourse as part of the roadway leading to the west from Angkor.

As mentioned, Phum Lovea is surrounded by two fragmented, encircling embankments separated by areas of lower elevation considered to be moats. The outer embankment averages about 20 m in width. The moat between this feature and the inner embankment averages 15 m across. The outer moat is irregular in places being over 70 m wide and 50 m wide in others. The inner moat varies in width between 50 m and 40 m terminating at the edge of the habitation mound. Two excavation units were opened over two seasons on the mound at Phum Lovea with both locations revealing a similar stratigraphy.⁸ Other smaller units were opened on the

6 Jacques Dumarçay and Michael Smithies, *Architecture and its models in South-East Asia* (Bangkok: Orchid, 2003).

7 Scott Hawken, 'Metropolis of ricefields: A topographic classification of a dispersed urban complex' (Ph.D. diss., University of Sydney, 2011).

8 The first excavation in 2011 to 2012 was 8 by 8 m, aligned north–south, located in the centre of the village. A second excavation unit was investigated on the mound at Phum Lovea in 2012 to 2013, located

embankments during the second field season to investigate the nature and mode of their construction. The archaeological excavation demonstrates initial occupation in the Iron Age and that the site was occupied through to the present.

Burials

The absence of inscriptional evidence in the prehistoric period necessitates a reliance on information gleaned from mortuary and residential contexts. The examination of human remains and accompanying grave goods can shed light on social organisation, material culture, health and trade and exchange. Excavations at Phum Lovea contained twelve interments, all of which date to the prehistoric period based upon the mortuary assemblage discovered and radiocarbon determinations. The burials contained a number of grave goods commonly found in Iron Age sites in Southeast Asia including iron tools, bronze decorative jewellery such as earrings and bangles, Indo-Pacific glass beads, agate and carnelian beads, grindstones, clay pellets for hunting, spindle whorls and ceramics. The burials at Phum Lovea also produced some items that are rarer in prehistoric contexts including a gilded earring, a marble bangle, a large, unusually-shaped carnelian bead and a Chinese coin which will be discussed further below.

Two radiocarbon dates were obtained from burial contexts placing the interment of these individuals between 137–340 cal CE⁹ and 132–353 cal CE.¹⁰ Based on excavations to date, the site appears to have been unoccupied prior to the Iron Age (c.500 BCE– 500 CE) and probably not prior to the second century CE.¹¹ Isotopic analysis of human skeletal remains from Phum Lovea and other Cambodian archaeological sites, spanning the Bronze Age through to post-Angkorian communities, is presently being conducted by the authors. This data will shed light on the residential behaviour of the individuals interred at each site and allow us to investigate differences in mobility between populations in different regions and throughout time.

Lovea in regional perspective

The Iron Age of Southeast Asia is characterised by a period of rapid change and increasing sociopolitical complexity culminating in the rise of early state polities. The region witnesses an expansion in trade and exchange, a florescence of morphologically complex settlements, population increase, social conflict, technological advances and expansion of agriculture. To illustrate this we will discuss Phum Lovea and other contemporary sites in Cambodia in their regional context.

In 2012 eight international teams formed the Khmer Archaeology LIDAR Consortium (KALC) to fund and carry out a LIDAR survey of Greater Angkor

60 m south of the first unit on a bearing of 351 degrees. Unit 2 was 3 m by 8 m running east–west lengthways.

9 At 94 per cent probability.

10 At 95.4 per cent probability.

11 Stewart Fallon et al., 'The next chapter in radiocarbon dating at the Australian National University: Status report on the single stage AMS', *Nuclear Instruments and Methods in Physics Research B* 268, 7–8 (2010): 898–901. Table 1 lists 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 inbuilt age for these samples, but there was little option in terms of dating the site. Dating was undertaken at the Radiocarbon Dating Centre at the Australian National University.

which included the site of Phum Lovea.¹² This research confirmed the scale and intricacy of the hydraulic network at Angkor and documented a formally planned urban landscape in which the major temples were integrated. Vast, anthropogenic changes to the landscape indicate a complex infrastructure that attempted to deal with the challenges faced by the Angkorian polity.¹³

The LIDAR data revealed that Phum Lovea is located in an area that slopes gently from the northeast to the southwest and the site itself is set on this slope with a difference of 0.5 m. Even though the landscape slopes, the outer embankment is consistently 13 m asl (above sea level) along its circumference meaning the embankment is c.50 cm above the landscape on the north–northeast side, and approximately a metre higher on the south.¹⁴ This suggests an attempt to retain water around the site.

Five locations on the moats and embankments at Phum Lovea were archaeologically investigated during the 2012 to 2013 field season. These excavations provided stratigraphic evidence for the construction of the embankments that encircle the site. The height of the inner embankment is 1.20 m above the natural layer where excavations were undertaken. The outer embankment, although substantial, is stratigraphically less well-defined than the inner embankment, but there is some indication that the sterile substrate in the area of the outer embankment was dug into in the past. The more complex nature of the stratigraphy atop the embankment is suggestive that soil was piled to form the embankment. In one section of the outer embankment the stratigraphy may indicate the re-excavation of the moats in the past as there is some indication that the sterile, natural soil was excavated and then a layer deposited that may represent run-off from the embankment. Together, the LIDAR data and the archaeological investigation indicate that the embankments and moats surrounding the site are indubitably anthropogenic and given their structure and morphology, indicative of a strategy for holding water around the site.

The presence of sites surrounded by moats and embankments has also been noted on the Khorat Plateau of northeastern Thailand since the nineteenth century.¹⁵ Typically these sites may be described as having a large habitation mound surrounded by up to five, flat-bottomed ditches, separated by embankments. A number of these sites have been excavated to varying degrees. Sites that have seen limited excavations

12 LIDAR utilises a laser mounted on an aircraft to measure distance. The reflected light is analysed providing an accurate map of the surveyed terrain. The programme was designed and executed by the University of Sydney, with governmental support provided by the APSARA National Authority under the direction of HE Tan Boun Suy.

13 Damian Evans et al., 'Uncovering archaeological landscapes at Angkor using LIDAR', *Proceedings of the National Academy of Sciences* 110, 31 (2013): 12595–600.

14 Damian Evans, 'Light Detection and Ranging (LIDAR) prospection at Lovea', in 'From paddy to pura: The origins of Angkor; The excavation of Phum Lovea, 2011–2013, A report to the APSARA Authority, Cambodia', ed. Douglas O'Reilly and Louise Shewan, unpub. report, Siem Reap, 2013, pp. 63–73.

15 Etienne Aymonier, *Voyage dans le Laos*, vol. 1 (Paris: E. Leroux, 1895); E. Aymonier, *Voyage dans le Laos*, vol. 2 (Paris: E. Leroux, 1897); H.P. Damrong Rajanubhap, *Visitations in Monthon Nakhon Rajasima and Monthon Udon Isarn in Rattanakosin 125 and B.E. 2449* (in Thai) (Bangkok: Diskul Foundation, 1995).

include Ban Don Phlong,¹⁶ Ban Takhong,¹⁷ Ban Prasat,¹⁸ Non Dua,¹⁹ Muang Phet,²⁰ Non Muang Kao,²¹ Major excavations include work at Noen U-Loke,²² Ban Non Wat,²³ and most recently, Non Ban Jak, as part of the 'Paddy to Pura' project directed by the authors (see Higham, this vol.).

Noen U-Loke, situated between the Huai Don Man Kasak and the Huai Yai rivers, is an impressive mound bounded by five concentric channels. This site was first investigated in 1986.²⁴ Further excavation of Noen U-Loke identified four major cultural layers that contained evidence for industrial, occupation and mortuary activity. The entire sequence in the area excavated lay within the Iron Age. The earliest Iron Age interments are thought to date to c.300 cal BCE.²⁵

Ban Non Wat, located 2 km from Noen U-Loke, is ringed by multiple moats. Excavations there uncovered remains dating from the Neolithic period through the Bronze Age to the Iron Age.²⁶ The excavations at Ban Non Wat and Noen U-Loke have occasioned the ability to subdivide the mortuary assemblage into a series of phases. The Iron Age has been determined by Higham to comprise four phases differentiated by variation in the burial assemblage and mortuary behaviour; the first dates between 400–100 BCE, the second c.100 BCE–200 CE, the third between 200–400 CE and the last, Iron Age 4, between 400–600 CE.²⁷

16 Eiji Nitta, 'Archaeological study on the ancient iron-smelting and salt-making industries in the northeast of Thailand: Preliminary report on the excavations of Non Yang and Ban Don Phlong', *Journal of Southeast Asian Archaeology* 11 (1991): 1–46.

17 Elizabeth Moore, 'Water enclosed sites: Links between Ban Takhong, Northeast Thailand and Cambodia', in *The gift of water: Water management, cosmology and the state in Southeast Asia*, ed. Jonathan Rigg (London: SOAS, 1992) pp. 26–46; Elizabeth Moore, 'Ancient habitation on the Angkor Plain: Ban Takhong to Phum Reul', *Proceedings of l'École Pratique des Hautes Études Symposium* (Paris: UNESCO; Sorbonne, 1993).

18 N. Monkhonkamnuanket, *Ban Prasat: An archaeological site* (in Thai) (Bangkok: Fine Arts Department [FAD], 1992).

19 Charles Higham, 'The late prehistory of the Southern Khorat Plateau, North East Thailand with particular reference to Roi Et province', in *Modern Quaternary Research in Southeast Asia* 3, ed. Gert-Jan Bartstra, Willem A. Casparie and Ian Glover (Rotterdam: A.A. Balkema, 1977) pp. 103–41.

20 H.G. Quarritch Wales, 'An early Buddhist civilization in eastern Siam', *Journal of the Siam Society* 45, 1 (1957): 42–60; Judith R. McNeill, 'Muang Phet: Quaritch Wales' moated site excavations re-appraised', *Bulletin of the Indo-Pacific Prehistory Association [BIPPA]* 10 (1997): 167–76.

21 Dougald O'Reilly, 'The discovery of clay-lined floors at an Iron Age site in Thailand: Preliminary observations from Non Muang Kao, Nakon Ratchasima province', *Journal of the Siam Society* 85, 1 (1998): 1–14.

22 Methadol Wichakana, 'Prehistoric sacrifices at Noen U-Loke' (in Thai), *Muang Boran* 16, 4 (1991): 69–79; *The origins of the civilization of Angkor; vol. 2, The excavation of Noen U-Loke and Non Muang Kao*, ed. Charles F.W. Higham, Amphan Kijngam and Sarah Talbot (Bangkok: FAD, 2007).

23 *The origins of the civilization of Angkor; vol. 6; The excavation of Ban Non Wat: The Iron Age, summary and conclusions*, ed. Charles Higham and Amphan Kijngam (Bangkok: FAD, 2012).

24 Wichakana, 'Prehistoric sacrifices at Noen U-Loke'.

25 Charles Higham, *Early cultures of mainland Southeast Asia* (Bangkok: River Books, 2002).

26 Charles Higham and Rachanie Thosarat, 'Ban Non Wat: The first three seasons', *Uncovering Southeast Asia's past: Selected papers from the 10th International Conference of the European Association of Southeast Asian Archaeologists* (Singapore: NUS Press, 2006), pp. 98–104; Higham and Amphan, *The excavation of Ban Non Wat*.

27 Higham et al., *The excavation of Noen U-Loke and Non Muang Kao*; Charles Higham, 'The Iron Age of the Mun Valley, Thailand', *Antiquaries Journal* 91 (2011): 101–44; Higham and Amphan, *The excavation of Ban Non Wat*.

The morphology of Phum Lovea is similar to the moated sites in northeast Thailand. The mound at Phum Lovea is smaller, aurally, than both Noen U-Loke and Ban Non Wat, but its moats and embankments cover a larger area.²⁸ While the moats and embankments surrounding the Iron Age sites in Thailand can be dated to the later part of the Iron Age sequence, and possibly coinciding with the rise of a powerful elite,²⁹ we have yet to establish firm dates for the construction of the moats at Phum Lovea. Nonetheless, the evidence for water management and the identification by remote sensing³⁰ of demarcated rice fields radiating from the central prehistoric mound hints at the establishment of a rudimentary water distribution system. Such early water management strategies soon transform, with the establishment of the Angkorian state, into an exceptionally sophisticated and complex hydraulic system.

Chronologically, the burials at Phum Lovea are contemporaneous to those denoted by Higham (this vol.) as belonging to Iron Age 3 in northeast Thailand c.200–400 CE. While the burial sample size from the Phum Lovea excavations is dwarfed by that of Ban Non Wat and Noen U-Loke, there are some broad similarities in material culture and burial treatment to the Iron Age 3 Thai sites. The burials at the Thai sites, as do most contemporaneous burials in Southeast Asia, contain ceramics, semi-precious stones and glass beads, jewellery and agricultural tools. There are, however, discernible differences in the mortuary assemblage uncovered at the Cambodian sites. At Phum Snay in Cambodia there was a substantial amount of military paraphernalia including swords and projectile points in mortuary contexts.³¹ Evidence of weaponry is not as prevalent at Thai sites nor was the high incidence of cranial trauma as reported at Phum Snay, where nearly one-quarter of the skeletal material (a combination of excavated and looted remains) exhibited evidence of traumatic lesions.³²

At Phum Lovea there is no evidence of the tight clustering of burials seen at Noen U-Loke, nor for the existence of clay-capped or rice-filled burials, although the latter occurs at nearby Prei Khmeng. The burials at Lovea were more clearly spaced out (although the sample size is small) and did not have a clay lining; rather the dead were placed in a pit and, based on the positioning of the bones, possibly wrapped in a shroud of some kind. Phum Lovea is also devoid of evidence for a striking differentiation in wealth, though this may be an artefact of sample size — at other sites in Cambodia, including Phum Snay and Phum Sophy, differential wealth has been as noted.

28 The size of the mound at Phum Lovea is c.6 ha and including the moats the site covers c.50 ha. At Noen U-Loke the mound is c.10 ha and with the moats covers c.23 ha and at Ban Non Wat the mound is c.9.5 ha and with the moats covers c.17 ha.

29 Dougal O'Reilly, 'Multivallate sites and socio-economic change: Thailand and Britain in their Iron Ages', *Antiquity* 82 (2008): 377–89; Dougal O'Reilly, 'Increasing complexity and the political economy model: A consideration of Iron Age moated settlements in Thailand', *Journal of Anthropological Archaeology* 35 (2014): 297–309.

30 Hawken, 'Metropolis of ricefields'.

31 Dougal O'Reilly, 'Excavations at Phum Snay, Cambodia', *BIPPA* 24, 2 (2004): 129–32.

32 Kathryn Domett, Dougal O'Reilly and Hallie Buckley, 'Bioarchaeological evidence of conflict in Iron Age, northwest Cambodia', *Antiquity* 85, 328 (2011): 441–58.

Phum Lovea and inter-regional exchange

Material culture unearthed by the excavations at Phum Lovea and other contemporary Cambodian Iron Age sites provide evidence for regional exchange and interaction. Exotic artefacts recovered from both burial contexts and occupation deposits at these sites include agate, carnelian and glass beads. Other items of the cultural assemblage illustrating regional interaction include ceramics, jewellery and possible foreign coinage.

Stone and glass beads, probably of South Asian origin, are common in burial assemblages in Iron Age sites in Cambodia. Alison Carter's analysis of the beads from Phum Lovea indicates that these objects likely have a similar origin.³³ Eight hundred-and-five glass and twenty-five agate and carnelian beads, primarily from burial contexts, were recovered at Phum Lovea and subjected to a stylistic, morphological, and compositional analysis. Seventeen of the stone beads from Phum Lovea were carnelian, while eight were agate.

To investigate whether the stone beads from Phum Lovea were more likely to have had a South Asian or Southeast Asian stone source, seven of the agate and carnelian beads were subjected to laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) by Carter.³⁴ The resulting compositional data were compared with South and Southeast Asian carnelian and agate sources, as well as to a selection of agate and carnelian artefacts from contemporaneous sites in Cambodia and Thailand. The beads from Phum Lovea, Angkor Borei, Ban Non Wat, Phum Snay, and Village 10.8 were compared to geological samples from India (Ratanpur and Paithan) and Southeast Asia (Ban Khao Mogul, Thailand; Kon Tum and Gia Lai, Vietnam; Dong Ngai, Vietnam, and Pacitan, Indonesia). Preliminary analysis suggests that the beads appear to be geochemically analogous to the Ratanpur, India source. That the beads were likely produced from an Indian raw material source is also consistent with the South Asian diamond-drilling technique used to produce the stone beads. The results tentatively suggest that the beads from Phum Lovea may be assigned to the Ratanpur source. However, as only a limited number of the many possible geological sources were included in the analysis, the most parsimonious interpretation is that the beads were geochemically distinct³⁵ from the other South and Southeast Asian sources.³⁶

Nearly all of the glass beads recovered are what are commonly known as Indo-Pacific beads, small, drawn monochromatic, oblate beads.³⁷ Orange and red opaque beads dominated the assemblage at Phum Lovea, with smaller numbers of dark blue and yellow beads. Twenty-two glass beads from Phum Lovea were also analysed using LA-ICP-MS to determine their composition.³⁸ Nearly all of the glass beads from Phum Lovea were high-alumina soda glass and classified as high-alumina

33 Alison Carter, 'Analysis of the stone and glass beads from Lovea', in O'Reilly and Shewan, *From paddy to pura*, pp. 25–36.

34 Carter, 'Analysis of the stone and glass beads from Lovea'.

35 The elemental composition of the beads was compared to samples of possible source materials of the beads to evaluate similarities and differences.

36 Carter, 'Analysis of the stone and glass beads from Lovea'.

37 Peter Francis Jr., 'Glass beads in Asia Part 2: Indo-Pacific Beads', *Asian Perspectives* 29, 1 (1990): 1–23; Peter Francis Jr, *Asia's maritime bead trade: 300 B.C. to the present* (Honolulu: University of Hawai'i Press, 2002).

38 Carter, 'Analysis of the stone and glass beads from Lovea'.

mineral soda glass, belonging to the Type 1 subtype³⁹ commonly encountered in prehistoric contexts in Southeast Asia, and believed to have been widely introduced during the mid to late Iron Age.⁴⁰ Such beads are suggested to have been manufactured in South Asia, and have also been identified at Phum Sophy, Phum Snay, Prei Khmeng, Noen U-Loke, Ban Non Wat and Angkor Borei.⁴¹ It is suggested that two beads exhibiting slightly different composition may have been produced at Khlong Thom/Khuan Lukpat on the west coast of the Thai–Malay Peninsula and another at Takua Pa, Thailand,⁴² but these origins cannot be unequivocally determined. Although it is difficult to make broad conclusions with a small sample size, it does appear that Phum Lovea and other contemporaneous sites in Cambodia's northwest formed part of a regional trading network.

Ceramics

The ceramics from Phum Lovea have not yet been fully analysed, but some preliminary observations can be made. As noted above, ceramics comprise a large proportion of the mortuary assemblage in prehistoric mortuary contexts and can be used to examine aspects of inter-regional exchange. 'Phimai Black' pottery, a ceramic tradition associated with the northeast Thailand sites, is encountered in Cambodian contexts at the site of Prei Khmeng⁴³ and further to the northwest at Phum Snay,⁴⁴ Phum Sophy and Kok Treas.⁴⁵ While Phimai Black vessels appear to be absent at Phum Lovea, the ceramic assemblage does include an unusual ceramic lid from a non-burial context that sees parallels farther afield. Similar lids have been discovered during the excavation of the Wat Komnou cemetery at Angkor Borei dated between 200 BCE and 200 CE.⁴⁶

The type is also seen in examples from collections from Oc Éo in Vietnam, the Royal Palace at Angkor,⁴⁷ Koh Phneao⁴⁸ in Angkor and Ayutthaya in Thailand (fig. 3).⁴⁹

39 Laure Dussubieux et al., 'Mineral soda alumina glass: Occurrence and meaning', *Journal of Archaeological Science* 37, 7 (2010): 1646–55.

40 Alison Carter, 'Trade and exchange networks in Iron Age Cambodia: Preliminary results from a compositional analysis of glass beads', *BIPPA* 30 (2010): 178–88; Dussubieux et al., 'Mineral soda alumina glass'; James Lankton and Laure Dussubieux, 'Early glass in Southeast Asia', in *Modern methods for analysing archaeological and historic glass*, ed. J. Koen (West Sussex: Wiley and Sons, 2013), pp. 413–41.

41 Carter, 'Analysis of the stone and glass beads from Lovea'; Carter, 'Trade and exchange networks in Iron Age Cambodia: Preliminary results from a compositional analysis of glass beads'; Alison Carter, 'Trade, exchange, and sociopolitical development in Iron Age (500 BC–AD 500) mainland Southeast Asia: An examination of stone and glass beads from Cambodia and Thailand' (Ph.D. diss., University of Wisconsin-Madison, 2013); Alison Carter and James Lankton, 'Analysis and comparison of glass beads from Ban Non Wat And Noen U-Loke', in Higham and Kijngam, *The origins of the civilization of Angkor*; vol. 6: *The Iron Age*, pp. 91–114.

42 Carter, 'Analysis of the stone and glass beads from Lovea'.

43 Christophe Pottier et al., *Mission Archéologique Franco-Khmère sur l'Aménagement du Territoire Angkorien (MAFKATA)*, Rapport de la Campagne 2003 (Siem Reap: APSARA-MAE-EFEO, 2003).

44 Dougald O'Reilly, 'Excavations at Phum Snay, Cambodia', *BIPPA* 24, 2 (2004): 129–32.

45 Heng Sophady, pers. comm.

46 Miriam Stark, pers. comm.

47 Louis Malleret, *L'archéologie du Delta du Mekong, vol. 2; La civilisation matérielle d'Oc-Éo* (Paris: EFEO, 1960).

48 Armand Desbat, 'Le site de Kok Phneao, XV^e siècle?', in *Programme CERANGKOR: Recherches sur les ateliers de potiers Angkoriens*, ed. A. Desbat (Siem Reap: EFEO, 2008), pp. 18–23.

49 Donn Hein, pers. comm.

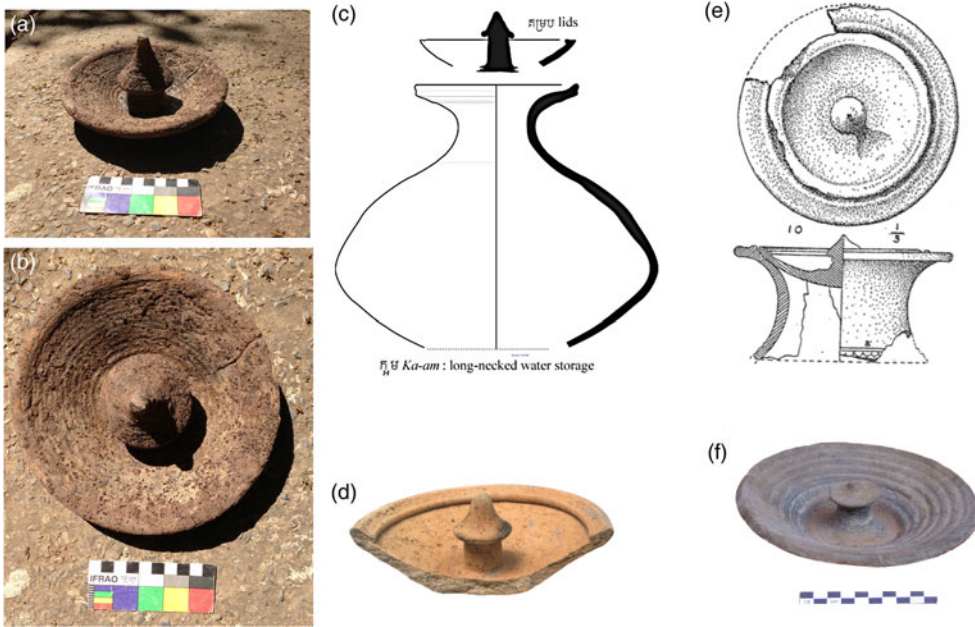


Figure 3. a. and b. ceramic artefact discovered in 3:7 F3, probable lid; c. example of similar lid from Cambodia; d. fine-paste-ware lid found at Angkor and f. lid from Phum Snay (at Wat Bo museum); e. a similar lid to that found at Lovea recovered from the basin of the Royal Palace at Angkor (Malleret 1960, pl. XLIII); (3d. and f. courtesy Rachana Chhay and Guillaume Epinal, respectively; image 3c. from Rachana Chhay et al., 'New evidence for utilitarian ceramic production in the Angkor Empire's core: The site of Kok Phnov, Siem Reap Province, Cambodia', paper presented at EurASEAA conference, Dublin, 18–21 Sept. 2012)

Variations of this artefact are found as *kendi* lids on vessels found at Phum Snay.⁵⁰ The ceramic lid found at Phum Lovea was associated with a small fragment of charcoal that returned a calibrated date of 3 BCE–141 CE⁵¹ coinciding well with the dates of the Wat Komnou cemetery at Angkor Borei. If the lid and the charcoal fragment were deposited coincidentally, it indicates a considerable antiquity for this form of pot lid and would suggest that the style had an extensive duration in Cambodia and further afield.

Miscellaneous artefacts

Other items of material culture such as jewellery and foreign coinage also attest to regional interaction. Gold jewellery of undetermined manufacturing source have been recorded at Prohear,⁵² Phum Sophy, and Phum Lovea, where a gilded earring was discovered. A marble bangle discovered in a burial context at Phum Lovea (fig. 4),

50 Jane Calthorpe and Kesornicole Pen, 'Wat Bo: Earthenware ceramics; Inventory of ceramics from Phum Snay, Banteay Meanchey held at Wat Bo, Siem Reap, Cambodia', unpub. report, Siem Reap, 2007.

51 95 per cent probability.

52 Sandra Schlosser, Andreas Reinecke, Roland Schwab, Ernst Pernicka, Sonetra Seng, and Laychour Vin, 'Early Cambodian gold and silver from Prohear: Composition, trace elements and gilding',



Figure 4. Marble bangle excavated at Lovea 2012

broken and repaired in antiquity, is unusual in Cambodian Iron Age contexts, but bears some similarity to bangles discovered in Bronze Age contexts at Nong Nor on the coast of Thailand, nearly 300 km distant.⁵³

A coin with a thick lip and a square hole in its centre but no evidence of any characters was discovered in Burial 11 at Phum Lovea. It is similar to post-Western Han (206 BCE–23 CE) classical coins.⁵⁴ The piece bears a resemblance to a coin held in the Fitzwilliam Museum in the United Kingdom⁵⁵ attributed to the Xin Dynasty or Wang Mang period c.9–23 CE (see fig. 5) and a very similar, Xin Dynasty coin is held by the Musée Guimet in Paris from an interment in Thung Thôn, Thanh Hó, Vietnam. Coins of this period have been found in Sa Huynh period burials in Vietnam.⁵⁶ It is impossible to say that the coin was placed in the grave at the time it was minted, but its presence does provide a *terminus ante quem* for the burial if the identification is accurate.

Continuity of occupation

Evidence derived from landscape analysis and evaluation of the moats supports the contention that the increasing complexity and technological advancement witnessed at Iron Age Phum Lovea is a precursor to the sociocultural transformations of first millennium CE state-level polities in Cambodia. The site appears to be continuously occupied from the prehistoric period, and the nascent water management

Journal of Archaeological Science 39, 9 (2012): 2877–87; Andreas Reinecke, Laychour Vin and Sonetra Seng, *The first golden age of Cambodia* (Bonn: German Foreign Office, 2009).

⁵³ Nigel Chang, pers. comm.

⁵⁴ Roberto Ciarla, pers. comm.

⁵⁵ Accession number CM.522–2000.

⁵⁶ Lam Thi My Dzung, 'Sa Huynh regional and inter-regional interactions in the Thu Bon Valley, Quang Nam province, central Vietnam', *BIPPA* 29 (2009): 68–75.



Figure 5. Coin excavated at Lovea (top left and right) x-ray of same; and a similar coin held by the Fitzwilliam Museum, Cambridge (bottom right, <http://webapps.fitzmuseum.cam.ac.uk/explorer/index.php?do=Search&qu=Wang%20mang&size=10&from=10> accessed Dec. 2015 © The Fitzwilliam Museum 2000–2015)

strategies employed at Phum Lovea may suggest the early manifestation of the sophisticated hydraulic system that becomes the hallmark of the later Kingdom of Angkor.

The mound complex of Phum Lovea was heavily modified during the prehistoric and/or Angkorian periods. There is evidence that the central mound of the site was altered at some stage into a rectangular shape, oriented to the northeast.⁵⁷ The dimensions are typically Angkorian, and the pronounced deviation in orientation towards the northeast is similar to features in the area around the western end of the West Baray. The existence of fine glazed ceramics at the site and the significant number of laterite temple blocks may attest to the existence of religious architecture here from the mid-first millennium CE onwards.

Scott Hawken, in his analysis of the landscape around Angkor, identified two sets of features, radial and linear.⁵⁸ The radial features comprise oxcart tracks and rice

57 Evans, 'Light Detection and Ranging (LIDAR) Prospection at Lovea'.

58 Hawken, 'Metropolis of ricefields'.

fields radiating out from a central prehistoric mound, of which Phum Lovea is an example. The tracks are argued to serve both a communicative and hydraulic purpose. The radial features integrate similarly patterned sites into contemporaneous clusters of settlements belonging to the prehistoric period.⁵⁹ In some places, the radial palimpsest is obscured by a linear rice field pattern, considered an Angkorian period characteristic. While these assumptions remain to be archaeologically tested, there is clear evidence that there exists a juxtaposition of linear and radial features around Phum Lovea. This may provide evidence for continued use and occupation of the site from prehistoric times through to the Angkor period and beyond. A string of similar radial sites to the north of Phum Lovea have been identified as prehistoric occupation mounds.⁶⁰ Within this cluster of radial sites there exists a number of overlying Angkor-period temples and ponds (*trapeang*) further demonstrating continued use of the area around Phum Lovea from the prehistoric into the historic period.

The water management strategies adopted in the prehistoric period at Phum Lovea appear to continue into the succeeding periods. The temples of Kok Chan and Banteay Sra, Angkorian foundations which are located nearby, have surrounding landscape grids that incorporate the prehistoric rice fields radiating from Phum Lovea.⁶¹ Hawken concludes that 'the Banteay Sra and Phum Lovea complex integrates a range of features from different periods'.⁶² This suggests that the site was of prolonged importance to Greater Angkor, serving as an eastern gateway and metropolitan outpost during the Angkor period.

Discussion

We have presented the findings produced by the excavations at Phum Lovea, the analysis of the material culture as well as landscape of the site and its surrounds. The evidence for increasing cultural complexity witnessed at Lovea is supported by finds from other Cambodian sites in the country's northwest. There is strong evidence for the gradual incorporation, as there is in many parts of Southeast Asia, of Indic elements beginning during the Iron Age. Initially this is evidenced by the presence of traded items and later, in the historic period, cultural ideals, including laws, language and religion, art and architecture. The impact on the indigenous cultures of Southeast Asia was profoundly transformative.

Exchange and interaction extended to eastern regions (China) as well as to the west (South Asia) as evidenced by the presence of a Chinese coin at Phum Lovea. It is possible such items travelled up the Mekong and Tonlé Sap rivers from the Mekong Delta region. The presence of a ceramic lid with clear parallels to those found at Oc Éo and Angkor Borei, both hypothesised to have been incorporated in the polity known as Funan, indicates further possible connections between these regions. Oc Éo is a known entrepôt and excavations there indicate that the trade network in which Funan was involved was far-reaching. Roman artefacts are found at Oc Éo, including medallions minted under Antoninus Pius (c.152 CE) and Marcus

59 Ibid.

60 These sites include: Roka Krom, Roka Leu, Tumreung, Chuk, Chuo Chakrei, Pongro, Romiet, Tonle Sar, Lbaeuk, Sambour, and Kok Chan.

61 Hawken, 'Metropolis of ricefields', p. 158.

62 Ibid.

Aurelius (c.161–80 CE), carnelian intaglios, and glass beads and bracelets⁶³ probably came via India. A coin bearing the image of a Persian king probably followed the same route.⁶⁴

There is evidence for communication and exchange of ideas across the Dang Raek Mountains as we find Phimai Black pottery similar to that of northeast Thailand in Iron Age interments in Prei Khmeng and in northwest Cambodia at Phum Sophy and Phum Snay.⁶⁵ Stylistic parallels are also evident between the regions with the marble bangle found at Phum Lovea bearing similarity to bangles found at Nong Nor, in southern coastal Thailand.

Phum Lovea and many of the Iron Age sites found in the Mun River Valley exhibit clear morphological parallels that may be indicative of knowledge/technology transfer. The analysis of both excavation and remote sensing data from Phum Lovea indicate that the moats and embankments around the site were anthropogenic in nature and were likely created to retain water to ensure adequate supplies during seasonal alterations or periods of prolonged drought, similar to those of northeast Thailand.⁶⁶ It is likely that these water retention features at Phum Lovea were constructed during the Iron Age. One of the main aspects of the Angkorian state was water management⁶⁷ and the available data from Phum Lovea suggests that the moats around the site may have been precursors of this. Hawken's research supports this contention with the incorporation of pre-existing field patterns into evolving and growing agricultural techniques that arose in the Angkor period.

Conclusion

Archaeological research conducted at Iron Age sites in Cambodia provides evidence for the emerging sociopolitical complexity that culminates in the cultural transformations that characterise state-level polities in the region. We have evidence for increasing engagement in inter-regional trade and exchange networks, technological advances, social conflict and site morphology and economic development.

Phum Lovea, based on the available evidence, was occupied initially at some point in the first or second centuries CE with the radiocarbon dates suggesting use of the area as a cemetery from around the first to late fourth century CE. The inhabitants constructed the embankments and moats as a strategy to hold and manage water. The site continued to be occupied through the Angkorian period and seems to have been occupied continuously until the present.

63 Louis Malleret, 'L'Archéologie du Delta du Mekong; vol. 3, La culture du Fou-nan' (Paris: EFEO, 1962), p. 112.

64 O'Reilly, *Early civilizations of Southeast Asia*.

65 Dougald O'Reilly et al., 'Report on the 2003 excavation of the Iron Age site of Phum Snay, Cambodia', *Udaya* 5 (2004): 219–25.

66 O'Reilly, 'Increasing complexity and the political economy model'.

67 Roland Fletcher et al., 'The development of the water management system of Angkor: A provisional model', *BIPPA* 28 (2008): 57–66; Ferenc Garami, and István Kertai, *Water management in the Angkor area* (Budapest: Angkor Foundation, 1993); Matti Kumm, 'Water management in Angkor: Human impacts on hydrology and sediment transportation', *Journal of Environmental Management* 90, 3 (2009): 1413–21; Elizabeth Moore, 'Water management in early Cambodia: Evidence from aerial photography', *Geographical Journal* 155, 2 (1989): 204–14; Leonid A. Sedov, 'Angkor: Society and state', in *The study of the state*, ed. Henri J.M. Claessen and Peter Skalnik (The Hague: Mouton, 1978), pp. 111–30; Paul Stott, 'Angkor: Shifting the hydraulic paradigm', in Rigg, *The gift of water*, pp. 47–58.

While there is evidence that sites such as Phum Lovea and other contemporary sites in northwest Cambodia participated in interregional exchange networks and maintained a significant developmental position in the trajectory of sociopolitical transformation from the prehistoric to the historic period, it is clear that an expanded research effort is needed to further investigate this critical juncture in Southeast Asian prehistory.