Unearthing the Ancient Secrets of Angkor in Cambodia

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Dr. Miriam Stark, University of Hawaii
May-July 2019
LETTER TO VOLUNTEERS

Dear Earthwatchers,

We are so pleased with the results of our second field season in Battambang! This year we returned to an area we started investigating in 2018 and were able to expand with multiple trenches to identify an important habitation area near the Prasat Basaet Temple. We also expanded another trench that shows strong evidence for metal working. With two field seasons under our belt, we’re learning about the long-term habitation in this area and can see changes in the material culture that might help us understand how this region became incorporated into the Angkorian Empire.

We also had some exciting cultural events during our field season. Our first field team was able to experience the opening blessing ceremony of our project. Later volunteers got to participate in a documentary film shoot for Channel News Asia as well as our first ever Community Archaeology Day, which saw approximately 60 people from the local community and high school visit our excavations. We were also pleased to be able to take field teams to see the local circus, Phare. Working in people’s backyards and with local archaeologists and workmen is another special part of our project. We were pleased that many of you got to see another side to rural life in Cambodia, and experience some refreshing fresh sugar cane juice with lunch!

Our successful field season could not have been possible without your help. Volunteers worked through the heat and rain to dig, screen artifacts, and wash and sort ceramics. We were pleased that 2-week volunteers could spend the weekend in Battambang and get to see more of this dynamic city. We are happy to share the preliminary results of our fieldwork with you here and look forward to our 2020 field season in Battambang!

Sincerely

Alison Carter and Miriam Stark

SUMMARY

During the May-July 2019 field season we excavated 8 trenches on two mounds surrounding Prasat Basaet Temple Battambang, began surveying the archaeological landscape around the temple, started a systematic study of our earthenware ceramics and faunal remains, and hosted a community archaeology day. Our excavations indicate habitation in this area from the Pre-Angkorian period (6-8th centuries CE) or earlier through the Angkorian Period (8-15th centuries CE), and possibly Post-Angkorian period (15-17th centuries CE). We also continued work on an area with evidence for metal working. Our working hypothesis is that people lived around the Basaet temple prior to its construction and that the area became increasingly incorporated into the Angkorian Empire following the temple’s construction. It is likely that the resident population included artisans like metalworkers and temple personnel.

GOALS, OBJECTIVES, AND RESULTS

Background and Introduction

The Angkorian Empire reached its apex from the 11th through 13th centuries CE, forming a complex web of settlements across much of modern-day Cambodia and Thailand. Most recent archaeological attention since 1995 has focused on the structure and function of the Angkorian capital (or Greater Angkor), where our project worked from 2010-2015. The capital, however, was connected to large provincial centers whose administrators and goods supported the state. Battambang was one of the most productive regions of the Angkorian polity and has a deep archaeological record of human occupation that extends at least 10,000 into the past, and perhaps even earlier (Heng, et al. 2016).

Our project focuses on the site of Prasat Basaet, c.11 km northeast of modern-day Battambang city. Prasat Basaet, consecrated to the god Jayaksetra, gained 11th-century prominence as one of Suryavarman I’s four sanctuaries dedicated to his Sûryavarmesvara linga that he installed across his realm. How these temple dedications fit within Suryavarman’s reign remains unclear, since this ruler came to power during a period of civil war and royal factionalism (Vickery 1985), and the earliest inscriptions in Battambang attributable to Suryavarman were inscribed more than a decade before the consecration of Prasat Basaet (Jacques 1985:232).

No epigraphic mention of Basaet has been documented before the Angkorian period. The scholar George Coedès attributed four Angkorian inscriptions to the temple (K. 205-208), with a fifth inscription, Pràsàt Tà Kè Pon, one kilometer to its...
14) to uncover more of the furnace. In this section we summarize the trenches excavated on Ta Rem's mound. Trenches related to the furnace/pyrotechnic feature are discussed in the Objective 3 section.

2019 Field Season Objectives and Methodology

Four central research objectives guided our May-July 2019 field strategy: (1) extending our knowledge of the site’s Angkorian occupation by continued work on two mounds we began excavating in 2018; (2) defining the boundaries of the Prasat Basaet temple community through systematic survey and reconnaissance of the area south of the temple; (3) continuing research on the pyrometric features identified in Trenches 4 and 6 in 2018; and (4) launching our materials analysis program for the Prasat Basaet temple community through systematic survey and reconnaissance of the area south of the temple; (3) continuing research on occupational chronology for the Prasat Basaet temple community and produced artifactual evidence for a deep historical record, stretching back to the period before recorded history.

Objective 1: Extending Our Knowledge of Angkorian Period Deposits at Prasat Basaet

In 2019, we returned to two locations we had investigated in 2018 (Figure 1 and Table 1). The first location is a mound located to the south of Bcaseat Temple on land owned by Ta Rem. In 2018 we began two trenches (Trenches 7 and 8) in this location. In 2019 we re-opened these trenches to continue excavation of Angkorian-period deposits. We also opened three additional units (Trenches 9/11, 12, and 15) on this mound in order to capture more of the horizontal distribution of activities and living floors.

The second area we returned to was the location of a possible metal-working furnace uncovered in Trenches 4 and 6 in 2018 on a mound owned by Ta Meak. In 2019, we extended these trenches to the West (Trench 10) and south (Trenches 13 and 14) to uncover more of the furnace. In this section we summarize the trenches excavated on Ta Rem’s mound. Trenches related to the furnace/pyrotechnic feature are discussed in the Objective 3 section.
Figure 1. Close-up view of map. Trenches excavated in 2019 in bold.
<table>
<thead>
<tr>
<th>Trench</th>
<th>Location</th>
<th>Year Excavated</th>
<th>Size</th>
<th>Depth below datum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Leum Peut’s mound</td>
<td>2018</td>
<td>1x2m</td>
<td>2.51m</td>
</tr>
<tr>
<td>2</td>
<td>Leum Peut’s mound</td>
<td>2018</td>
<td>1x2m</td>
<td>2.26m (Northern part of trench) 2.5m (Southern part of trench)</td>
</tr>
<tr>
<td>4</td>
<td>Ta Meak’s mound</td>
<td>2018</td>
<td>1x2m</td>
<td>1.26m (Northern part of trench) 1.01(Southern part of trench)</td>
</tr>
<tr>
<td>6</td>
<td>Ta Meak’s mound</td>
<td>2018</td>
<td>1x2m</td>
<td>0.7-.079m 0.47m (southwest corner)</td>
</tr>
<tr>
<td>7</td>
<td>Ta Rem’s mound</td>
<td>Started 2018</td>
<td>1x2m</td>
<td>1.63m</td>
</tr>
<tr>
<td>8</td>
<td>Ta Rem’s mound</td>
<td>Started 2018</td>
<td>1x2m</td>
<td>1.7m</td>
</tr>
<tr>
<td>9 and 11</td>
<td>Ta Rem’s mound</td>
<td>2019</td>
<td>1.5x2m</td>
<td>1.25m</td>
</tr>
<tr>
<td>10</td>
<td>Ta Meak’s mound</td>
<td>2019</td>
<td>1x2m</td>
<td>0.23-0.6m</td>
</tr>
<tr>
<td>12</td>
<td>Ta Rem’s mound</td>
<td>2019</td>
<td>1x2m</td>
<td>1.65m</td>
</tr>
<tr>
<td>13</td>
<td>Ta Meak’s mound</td>
<td>2019</td>
<td>1x2m</td>
<td>0.41-0.7m</td>
</tr>
<tr>
<td>14</td>
<td>Ta Meak’s mound</td>
<td>2019</td>
<td>2x2m</td>
<td>0.42-0.77m</td>
</tr>
<tr>
<td>15</td>
<td>Ta Rem’s mound</td>
<td>2019</td>
<td>2x2m</td>
<td>0.65m</td>
</tr>
</tbody>
</table>

Table 1. List of trenches excavated during the 2018 and 2019 field season

Trench 7
Trench 7 was excavated to a depth of 1.11m below datum in 2018. A dark soil feature was observed in the northwest corner of the trench on the surface of 7015. Stoneware ceramics were also still being recovered in US 7014 indicating there were still Angkorian-period contexts to excavate. For this reason, it was decided to re-open this trench in 2019 to continue excavation. We resumed excavations at US 7015 and continued until US 7025 finishing at a depth of 1.63m below datum. US 7015 was determined to be the top of a large Angkorian-era pit that was dug through Pre-Angkorian layers; the bottom of the pit contained a Chinese Longquan celadon plate (Figure 2). The first fine-paste kendi vessel fragment was identified in US 7023 and no stoneware or tradeware ceramics were observed after US 7021 (1.33m below datum). Excavations were stopped once it was determined we had reached Pre-Angkorian layers.

Trench 8
In 2018, Trench 8 contained a possible garbage dump that contained numerous ceramics and animal bones, including a large portion of a turtle shell. This trench was dug to 1.32m below datum in 2018 and while it was suspected that we had reached Pre-Angkorian layers, two additional spits (US 8017 and 8018) were excavated in 2019 to confirm this. As no stoneware or tradeware ceramics were identified in these layers, excavations ceased in this trench to focus on opening additional units.
Figure 2. West Wall of Trench 7 showing the large pit feature. Note the celadon plate at the bottom north (right) corner of the pit.

Trenches 9 and 11
Trench 9 was opened in 2019 and located 1m south of Trench 7. This trench proved to have rich archaeological deposits and appears to be the location of residential activities. The surface of US 9005 (45cm below datum) contained numerous artifacts on the surface (Figure 3). For this reason, it was decided to extend the trench 50cm to the south and create Trench 11. Trench 11 was excavated in identical spits to the same depth as the surface of US 9005 and then both trenches were excavated together as one unit in 5cm spits that we have called Trench 9/11. Living floor surfaces (including flat lying sherds, roof tiles, fired clay, and bone) appeared in 9003/11003 and continued until 9012/11012. A possible post hole feature was identified in 9007/11007 and then further post hole features were identified in 9008/11008 surface. Notable artifacts recovered from this trench include large pieces of Chinese tradewares, several large roof tiles, and metal pieces including a possible pewter ingot and small lead pieces that were coiled or pinched on the ends (Figure 4). A decrease in material remains was noticed beginning around US 9019/11019 (approximately 80-90cm below datum), suggesting a transition to Layer 3. Due to time constraints, excavations stopped at the surface of 9029/11029. Small pieces of stoneware and tradewares were identified in the previous spit (9028/11028) so the Angkorian period layers may continue.
Trench 12
Due to the rich material remains identified in Trenches 9 and 11, we decided to open another 1x2m unit 1.5m to the south of Trench 11. This unit recovered similar material remains as Unit 9/11, although clear post holes were not identified. This unit also contained higher concentrations of fired clay and architectural brick, especially in US 12005 (50cm below datum) (Figure 5). Also in this layer were large piece of a white stone, which we believe to be limestone. The purpose of this limestone is unclear, although limestone has been used both to make stucco used on brick temples and in the chewing of betel nut. Beginning with US 12005, spits were excavated in 5cm layers instead of 10cm layers. As in Trench 9/11, ceramics began to decrease approximately 80-90cm below datum (US 12011) suggesting a transition to Layer 3. Green glazed stoneware was recovered as deep as spit 12024 (149-156cm below datum) so it is possible that the Angkorian-period layers continue. However, due to time constraints, we finished excavation of this trench this year at the surface of US 12026 (165cm below datum).

Trench 15
Trench 15 was the final unit excavated in 2015. It was placed 8 meters south of Trench 12 and situated so that the west wall of this 2x2m unit was in line with the east wall of Trenches 12, 9/11, 7, and 8. This trench location was selected as it was an open...
area on the slope of the mound and we hoped it would tell us more about the spatial distribution of activities on the mound. The trench was excavated in two halves, with artifacts from the north 1x2m half of the trench being collected separately from those in the south 1x2m half of the trench. Due to time constraints, we were only able to excavate this unit to 65cm below datum, however flat lying sherds, fired clay, and faunal remains indicate living floor surfaces. A possible post hole and pit feature were identified on the surface of 15005 (47cm below datum). Additional post holes were identified on the surface of 15012, but remain unexcavated due to the end of the field season. The soil in this unit was different from others on this mound, with a more complex stratigraphy, especially on the eastern half of the mound. One crewmember suggested it appeared that soil was being dug up and piled on the mound as part of mound building activities. We also observed differences in the distribution of artifacts across the northern and southern halves of the unit. From US 15001-15003 there were more ceramics on the North side of the trench than the South side. There was also less animal bone and fired clay and brick. However, after 15003, this trend changed and there were more ceramics, animal bones, fired clay, and brick on the south side of the trench. The meaning of this shift is thus far unclear.

Figure 5. Surface of 12005 showing brick and possible limestone fragments on the surface.

Revised Occupational Sequence

In 2018 we had proposed an occupational sequence that included possible proto-historic, Pre-Angkorian, and Angkorian layers. Following our initial radiocarbon dates and additional excavations in the 2019 field season, we present the following revised occupational sequence. We have currently identified six layers across the site, which we have numbered sequentially. Individual trenches may have localized sublayers, which were labeled 1a, 1b and so forth. Our layers and occupational sequences is
summarized in Table 2 (below). Figure 6 displays the stratigraphy of the layers on the mound that included Trenches 7, 8, 9/11, 12, and 15.

Layer 1 represents the topsoil layer (generally the top 20-30cm of soil) that included a mix of both Angkorian ceramics and modern artifacts, including plastic and metal. Layer 2 is associated with the Angkorian period following the construction of the Basaet temple, primarily the 12-13th centuries. This layer has high concentrations of ceramics, bone, and fired clay and includes living floor surfaces in the form of flat-laying sherds and frequently post-holes. Following this is Layer 3. In 2018, we observed a reduction in the number of ceramics, especially Khmer stonewares and tradeware ceramics in this layer. We had proposed at the time that this layer might date the transition between the Pre-Angkorian period to the Angkorian period. However, a radiocarbon sample from this layer (1014.16.01) returned a date in the mid-11th century. Careful inventory of our ceramics has also identified that Khmer stonewares and Chinese tradewares still appear in this layer, although in much smaller quantities. Our current hypothesis is that Layer 3 dates to the early Angkor period (9-11th centuries CE), prior to the construction of the temple and before this region was fully integrated into the Angkorian state and ceramics trade network. Earthenware ceramics show a continuity from the Pre-Angkor period. In multiple trenches, this layer appears approximately 80-90 cm below datum. We associate Layer 4 with the Pre-Angkorian period (6-8th centuries). In several trenches, this layer appears to begin approximately 1.3m below datum and is frequently associated with an increase in ceramics and surface features, such as possible living floors and garbage deposits. Earthenware ceramics associated with this layer include the unique high-fired painted wares, fine paste wares, and kendi vessels. Layer 5 is associated with the protohistoric period, which terminates in the 4-6th centuries CE. In 2018 we excavated two trenches to this layer (Trench 1 and 2) but no trenches in 2019 were excavated to this depth. Layer 6 is associated with natural or sterile soil. We reached this depth in Trench 1 and 2 in 2018, but no trenches were excavated to sterile in 2019. This is one goal for our 2020 field season.

<table>
<thead>
<tr>
<th>Layer</th>
<th>Time Period</th>
<th>Relative dating source and Material collected</th>
<th>Inferred activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mixed context</td>
<td>Topsoil layer that includes Angkorian stoneware and earthenware ceramics and modern artifacts such as plastic, metal, and glass</td>
<td>Bioturbation from modern living activities on the mound results in mixing of modern and Angkorian contexts</td>
</tr>
<tr>
<td>2</td>
<td>12-13th centuries CE</td>
<td>Angkorian stoneware and earthenware ceramics, some metal artifacts, bone, fired clay, and brick. Includes possible living surfaces</td>
<td>Residential occupation of the area following construction of Basaet temple in the 11th century.</td>
</tr>
<tr>
<td>3</td>
<td>9-11th centuries CE</td>
<td>Reduction in ceramics, bone, and other artifacts overall. Ceramics found are primarily earthenware with small amounts of Angkorian stoneware and Chinese tradewares. Generally begins approximately 80-90cm below datum.</td>
<td>Residential occupation of the mound prior to construction of the Basaet temple. Shows continuity with Pre-Angkor period</td>
</tr>
<tr>
<td>4</td>
<td>6-8th centuries CE</td>
<td>Earthenware ceramics and no stoneware or Chinese tradeware. Includes high-fired painted earthenwares, fine-paste wares, and kendi vessels. Increase in quantity of ceramics from Layer 3. Numerous faunal remains.</td>
<td>Associated with Pre-Angkorian habitation of the landscape around Basaet temple.</td>
</tr>
<tr>
<td>5</td>
<td>4-6th centuries CE</td>
<td>Earthenware ceramics and faunal remains</td>
<td>Proto-historic or Iron Age habitation of landscape around Basaet temple</td>
</tr>
<tr>
<td>6</td>
<td>Natural or Sterile soil</td>
<td>No artifacts or evidence of human habitation. Approximately 2.5m below datum.</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Provisional time periods and activities associated with each of the six layers identified in the 2018 and 2019 Prasat Basaet excavations.
Objective 2. Defining Prasat Basaet Community Boundaries Using Survey/Reconnaissance

French colonial scholars since the mid-19th century have visited and documented the sandstone temple we now call Prasat Basaet (Bruguier 2015: 29). The Basaet temple required a large population to construct it and support a range of regular activities undertaken there. Twelfth-century epigraphic sources from the Angkorian capital suggest that state temples required the work of thousands of people for its construction and maintenance. More than 12,000 people lived within the Ta Prohm temple enclosure as support staff, teachers and students; an additional 65,000 people from outlying villages also provided goods and services to the temple (Coedès 1906: 77). The contemporary Preah Khan temple required even more people to support its activities: Jayavarman VII donated 5,324 villages, and more than half of them (54,784, or 55.9%) worked directly for the temple as servants, cooks, dancers, and to make offerings to the gods (Coedès 1941:292-293).

The provincial Prasat Basaet temple, built more than 150 years earlier than Ta Prohm and Preah Khan, was smaller than contemporary monuments built elsewhere in the Angkorian kingdom. Yet it must have required a sizeable community of villages for its construction and support, and one project goal is to understand the Prasat Basaet community whose members were critical to its use. Initial reconnaissance during the 2018 field season suggested that areas south of the temple contained abundant mounds, and some with high artifact densities that suggest habitation. Some mounds with abundant artifact concentrations are still visible; these were likely house mounds that included several structures and garden areas. Some mounds have been destroyed, likely for agricultural purposes, leaving artifact scatters in the rice fields (see Figure 7) and along the bunds, which may represent the edge of the former mound.
crew members spent approximately two weeks during the 2019 field season engaged in GPS survey and interviews with local villagers to define the Prasat Basaet community. Crew members were able to document archaeological features in more than half of the area south and southwest of the temple. Figure 8 illustrates the approximate survey coverage, which we plan to continue in 2020 to define the southeastern, eastern, and northern sections of the community. Post-field season analysis of records and surface artifacts is necessary to associate each of the mounds with archaeological materials to either the pre-Angkorian, the Angkorian, or both pre-Angkorian and Angkorian periods.

![Figure 8. Google Earth map showing boundaries of 2019 survey.](image)

**Objective 3. Continuing Research on the Pyrometric Features**

Angkorian temples were likely repositories for precious metal objects given as donations and gifts to the gods and many sculptures of Khmer gods were also made from bronze and other metals (Polkinghorne et al. 2014). In 2018, a possible metal working furnace was uncovered in Trenches 4 and 6 and we suspect this might be the location of a craft workshop producing objects for the Basaet temple. In 2019, we returned to this area and expanded our trenches to capture more of this feature. Trench 10 is a 1x2m extension of Trench 6 to the west, Trench 13 is a 1x2m extension of Trenches 6 and 10 to the south, and Trench 14 is a 2x2m extension of Trench 13 to the south (Figure 1). Radiocarbon dates from the 2018 season suggest that this area was in use at least during the 8-9th centuries CE. The furnaces themselves are small and the crucibles used in them were likely small as well. In 2018, we identified numerous small cups or bowls in multiple trenches that we at the time believed were crucible fragments. However, examination by Ms. MEAS Sreyneath concluded that most of these objects might be small lamps, and that only a small number were actually crucible fragments (Figure 9).

Trenches 10, 13, and 14 contain evidence for a metallurgical workshop with red and orange fired clay features. One circular feature was identified on top of the fired clay floor, which we designated as US 10009. Half of this feature was excavated and could see a trace of a high fired furnace, including fired clay on the top south edge of the circular trade (see Figure 10). In Trench 13 we identified 6 additional small furnaces Each of these furnaces were circular and deep, measuring approximately 20-30cm in. diameter. The inside walls were dark red, indicating that they were high fired. One furnace, US 13009, was excavated in order to understand the shape of the furnace. We found three layers of fired clay that appear to be distinct from one another and suggests that there were three furnaces in the same location. Apart from the furnace structure, we found some artifacts such as ceramic fragments, charcoal, fired clay, and a possible crucible used to melt the metal. Three separate floors were identified in Trench 14 (Figure 11). The uppermost layer has been designated the first floor and is a red color (US 14012), which is 9cm thick. Multiple furnace features were found on this floor: 14013A, 14013B, 14013C, 14015, and 14027. The second floor is yellow in color and between 6 to 7cm thick. Only one furnace was associated with this floor (US14013A). It is possible that two other furnace features that we have not yet investigated might be associated with this floor (US 14028 14029). The lowest floor or third floor (US14017) is orange and covers the entire workshop area and contained several large and small furnaces. The first and second floors do not cover the whole trench but are only seen in the southern part of Trench 14. After excavation, it was concluded that all the furnaces were built on top of each other and seemingly used many
times. We plan to continue and extend excavations in this area in 2020 and hope that this work might help us understand the structure of the workshop and function of the furnaces.

Figure 9. Objects identified as crucibles found in 2018 and 2019 excavations.

Figure 10. The red circle indicates the circular feature that may be a furnace.
Objective 4. Launching Ceramic and Zooarchaeological Studies

Excavation represents only part of the research we do as archaeologists and each field season we uncover many artifacts and ecofacts that must be carefully catalogued and studied. These material remains help us understand more about the human lived experience at Prasat Basaet.

a) Ceramic Studies

All 2018 and 2019 excavated ceramics were sorted into basic ware groups listed in Table 3, which project members developed for the Angkor-area 2010-2015 field seasons. Some, but not all of these categories (i.e., Khmer stonewares, Thai and Vietnamese stonewares, Chinese porcelains, and Khmer earthenwares) were identified in the Prasat Basaet excavations. Low-fired earthenwares were recovered from every phase at the site. Layers 4 and 5 (protohistoric/Late Iron Age) contained only earthenwares: both utilitarian (i.e., cooking and storage) vessels and fine-paste ceramics (e.g., buffware kendi and painted bowls and jars). Angkorian period deposits across Greater Angkor and in provincial Angkorian sites also include earthenware ceramics as containers and, less commonly, rooftiles. Layers 2 and 3 date to the Angkorian period before and after Suryavarman dedicated the temple. Ceramics from these deposits include earthenwares (low-fired and high-fired), Khmer stonewares (green-glazed, brown-glazed and unglazed) and some Chinese tradewares. Chinese imported ceramics, which we call Chinese tradewares, first appeared in the Angkorian area in the 10th century CE and increased in frequency through the early 14th century (Cremin 2006: 122; Dupoizat 2018:131; Groslier 1981:30). Most Chinese tradeware sherds from Prasat Basaet are too small to determine vessel shape (and also vessel function). Dupoizat (2018:132) suggests, however, that 12th-15th century Khmers in Angkor Thom used Chinese ceramics to hold perfume, store cosmetics and lime for betel nut, and for temple rituals.
<table>
<thead>
<tr>
<th>Type</th>
<th>Ceramic Group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unglazed stoneware</td>
<td>Khmer stonewares (including rooftiles)</td>
</tr>
<tr>
<td>2</td>
<td>Brown Glazed stoneware</td>
<td>Khmer Brown Glazed wares (including rooftiles)</td>
</tr>
<tr>
<td>3</td>
<td>Green Glazed stoneware</td>
<td>Khmer Green Glazed wares (including rooftiles)</td>
</tr>
<tr>
<td>4</td>
<td>Thai stonewares</td>
<td>Sawankhalok &amp; Si Satchanalai kilns (including rooftiles)</td>
</tr>
<tr>
<td>5</td>
<td>Chinese ceramic wares</td>
<td>Chinese porcelains (not including stonewares)</td>
</tr>
<tr>
<td>6</td>
<td>Vietnamese ceramic wares</td>
<td>Stonewares that postdate the 15th century</td>
</tr>
<tr>
<td>8a</td>
<td>Earthenwares: utilitarian</td>
<td>Including cooking pots, storage jars and other culinary shapes</td>
</tr>
<tr>
<td>8b</td>
<td>Earthenwares: industrial</td>
<td>Including metallurgical ceramics (i.e., crucibles, molds), lamps, and ceramic production tools (e.g., anvils)</td>
</tr>
</tbody>
</table>

Table 3. Basic ceramic ware groups identified in 2018 and 2019 Prasat Basaet excavations.

General Ceramic Trends: Counts and Weights
Pteah Cambodia excavations at Prasat Basaet recovered nearly 24,000 sherds larger than 2 cm in area during the 2018 and 2019 excavations. Table 4 presents summary data on proportions of ceramics by category. As would be expected from residential deposits, earthenwares dominated the ceramic assemblage from every excavated deposit, and across time periods. We note that this pattern supports earlier work at residential Angkorian sites in the Greater Angkor region (e.g., Bâty et al. 2014:365; Pottier et al. 2017:295).

<table>
<thead>
<tr>
<th>Ceramic Category</th>
<th>Count</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthenwares &gt; 2cm</td>
<td>23298</td>
<td>94%</td>
</tr>
<tr>
<td>Unglazed stonewares</td>
<td>429</td>
<td>1.70%</td>
</tr>
<tr>
<td>Brown glazed stonewares</td>
<td>424</td>
<td>1.70%</td>
</tr>
<tr>
<td>Green glazed stonewares</td>
<td>167</td>
<td>0.60%</td>
</tr>
<tr>
<td>Chinese tradewares</td>
<td>457</td>
<td>1.80%</td>
</tr>
<tr>
<td><strong>TOTAL (2018-2019)</strong></td>
<td><strong>24775</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Table 4. Proportion of different categories in the Prasat Basaet 2018 and 2019 excavated deposits.

Prasat Basaet ceramic patterning differed by time period. For example, protohistoric and Pre-Angkorian deposits yielded only earthenwares. Layers 2 and 3 were dominated by earthenware ceramics, which significantly smaller proportions of stonewares (glazed and unglazed) and non-local ceramics. Stonewares comprise a smaller percentage of the ceramic assemblage than do earthenwares, and Chinese trade wares in nearly every location (except for Angkor Thom’s Royal Palace) rarely exceed 5% of the total ceramic assemblage (Cremin 2006: 123, Table 2). Table 3 illustrates that Chinese tradewares comprised less than 2% of all the excavated ceramics from our 2018 and 2019 excavations.
Khmer Stoneware Production and Exchange Project

Angkorian stonewares were widely used by Angkorian people and their presence at Basaet indicate its connection to the Angkor Empire. Table 3 indicates that stonewares (unglazed, Brown glazed and Green glazed) represent a small proportion of the Basaet ceramic assemblage, but hold great potential for understanding relationships between Battambang and Greater Angkor during the Angkorian period. The Khmer Production and Exchange Project (KPx) has explored stoneware manufacturing, distribution, and consumption patterns. Previous KPx work has focused on stoneware kilns and their geochemical patterning (e.g., Grave et al. 2015; Marriner et al. 2018). The next phase of the project includes “consumption” sites where Angkorian people used -- but did not make -- Khmer stonewares. By studying the compositions of the stoneware ceramics at Basaet, we are able to identify from which kiln sites they originated and determine Basaet’s position within the Angkorian economy. For this reason, seventy-two (72) stoneware ceramic samples from the 2018 field excavations were selected for study using Neutron Activation Analysis and will be included as part of Tiyas Bhattacharyya’s Master’s thesis. We also selected an additional 84 stoneware ceramic sherds from the 2019 excavations for which we will seek permission to study.

Earthenware Study Project

The fact that earthenwares comprise the overwhelming majority of ceramics recovered from our excavations underscores the need for detailed earthenware ceramic study. For this reason, Dr. Carmen Sarjeant joined the 2019 excavation at Prasat Basaet to begin work on characterizing the earthenware assemblage. The initial goal was to develop a sorting system for the Prasat Basaet earthenwares that could be easily adopted by local archaeologists. Sarjeant developed and applied a sorting system over three weeks, the first week in Siem Reap at the École française d’Extrême Orient and the following two weeks on-site at the field laboratory at Prasat Basaet. In 2018, the ceramics had been categorized according to a system for all of the ceramic materials in which sherds were sorted into broad categories (stoneware, porcelain, earthenware and fired clay). The earthenware utilitarian vessel sherds were all categorized as “8a” in this system, and encompassed a great deal of variety in ceramic form, fabric, and surface treatment. A new sorting system was developed, and these sherds were re-sorted into the clearly defined groups of this system. Development of this earthenware classification provided crew members with guidance in recording the 2018 and 2019 earthenware ceramics recovered from the Basaet excavations and we were pleased to include Earthwatch volunteers in this process. Classification of all the 2018 earthenwares has been completed, and the 2019 ceramics are now undergoing analysis.

b) Faunal remains

The study of animal remains can offer insights on human diet and the local environment through time. Unlike our previous projects at Angkor, the preservation of faunal remains at Prasat Basaet is exceptional, providing a new line of evidence for the examination of the lives of Angkorian people. MA student Ms. Patricia Andrea Cabrera (Archaeological Studies Program, University of the Philippines Diliman) joined Peath Cambodia from June 17th until July 5th, 2019 to begin analyzing zooarchaeological material from the 2018 and 2019 excavation seasons at Prasat Basaet. The aim was to wash, sort, and bag according to anatomical element (except for fish remains), and record these in an Excel spreadsheet to facilitate future analysis and research on the subject. The state of preservation of the assemblage allowed identifications for some diagnostic specimens of terrestrial taxa, and these may be improved with a classification to lower taxonomic levels and a higher level of confidence by using a reference collection. Due to time constraints, only the faunal material from Trenches 1 and 2 were recorded. These trenches were prioritized as it is hypothesized that these may have been garbage deposits that reflect the diet of the people who lived in the site starting from Pre-Angkorian times, although the other trenches look promising as well, especially Trenches 7, 8, and 15.

The Prasat Basaet community is located close to the Steung Chas or “Old River”, and residents have always used resources from the river. Among the consistently most common animal remains recovered from the 15 trenches are turtles, large mammals (bovids, suids, and cervids), and fish (Figure 12), providing some preliminary insight into human-animal interactions by showing which animals were exploited by the inhabitants of the site throughout time as part of their diet or for other purposes. Shell fragments (Figure 13) were also recovered, although in much smaller quantities compared to their vertebrate counterparts. Upon sorting, these shell fragments were bagged separately from the rest of the faunal remains to prevent getting crushed by the heavier-built pieces of bone. A total of 413 bone fragments, mostly of mammals, was selected for possible export to the University of the Philippines so further work can be done in terms of morphological comparisons with a modern collection, as well as closer inspection of taphonomic modifications as part of a Master’s thesis research.
Figure 12: Faunal remains from Trenches 1 and 2 during the 2018 excavation season. Top left: A sample of large mammal remains from Trench 2, US 2024. Top right: A sample of turtle carapace and plastron fragments from Trench 1, US 1025. Bottom right: A sample of fish remains from Trench 1, US 1035.

Figure 13. left to right: A sample of shells from US 2028, US 2025, and US 15004N.
Pteah Cambodia Community Archaeology

On Friday June 21, 2019 Pteah Cambodia conducted a community archaeology site visit organized by project member Raksmy Muong. The goal of this project was to engage local stakeholders with their national cultural heritage by teaching them about the archaeological activities taking place near their homes. Stakeholders included local residents (30 people) and grade 9 students from Tapon Secondary School (30 students). Local authorities, including the Provincial Department of Culture and Fine Arts of Battambang (PDCFAB), the Official Police of Heritage (OPH), the representative of local community, warmly supported and participated in this event. The Community Archaeology event was divided into three components: (1) an introductory session in which local heritage authorities introduced visitors to the site and provided a lecture on the importance of preserving cultural heritage; (2) a visit to ongoing field excavations where visitors could observe archaeologists at work; and (3) a visit to the on-site laboratory analysis area, where crew members were washing, packing, inventorying, and analyzing archaeological materials. Figure 14 illustrates the first part of the visit, when everyone gathered at the Prasat Basaet temple for introductory remarks.

This three-part program aimed to explain the archaeological process, illustrate findings from Prasat Basaet temple fieldwork, and solicit questions and concerns from local residents concerning the ongoing Pteah Cambodia project in their village. Visitors were divided into two groups: local (adult) residents and high school students. Each group began their journey in different locations: Group 1 began in the on-site laboratory analysis area (Figure 15), while Group 2 began by visiting the excavation trenches.

![Figure 14. Beginning of Community Archaeology Day at Prasat Basaet (21 June 2019).](image-url)
Most local residents who participated in this Community Archaeology event were women, and they seemed interested in the archaeological process. They were especially curious about how the excavations took place and the kinds of artifacts that archaeologists have recovered. By the end of their visit, they happily informed the program on what they have noted about possible archaeological sites, which included both mounds and artifact scatters located in their rice fields. Group 2 students were equally interested in the presentation, and concentrated specifically on the methodology of how archaeologists conduct the field excavation, documentation, and publication. Our 2019 Community Archaeology Day received greater attention than we expected. During the site visit, visitors were interested in the archaeological work and learned about how research and site protection are important parts of the archaeological process.

In sum, the 2019 Prasat Basaet field excavations support our contention that the Prasat Basaet community was established centuries before Suryavarman I dedicated the temple. Our archaeological work suggests that people occupied the area continuously from the protohistoric to the Angkorian period, and -- based on evidence for pre-Angkorian occupation in the region -- pre-Angkorian community may also have been focused on temples. Our survey program just began, but early indications are that the Prasat Basaet community was much larger than the temple area itself, and included residents engaged in a variety of craft manufacturing activities that included metallurgy.
PROJECT IMPACTS

1. Increasing Scientific Knowledge

a) Total citizen science research hours

<table>
<thead>
<tr>
<th>Team</th>
<th>Number of volunteers</th>
<th>Total Hours per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team 1a</td>
<td>6</td>
<td>240</td>
</tr>
<tr>
<td>Team 1b</td>
<td>6</td>
<td>240</td>
</tr>
<tr>
<td>Team 2a</td>
<td>4</td>
<td>160</td>
</tr>
<tr>
<td>Team 2b</td>
<td>4</td>
<td>160</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>800</td>
</tr>
</tbody>
</table>

b) Peer-reviewed publications

We do not yet have any peer-reviewed publications but following our 2020 field season, we are planning a manuscript discussing our fieldwork, radiocarbon dates, and preliminary results from analysis of artifacts and ecofacts.

c) Non-peer reviewed publications:


d) Books and book chapters

e) Presentations:

Carter, Alison, Miriam Stark, Tiyas Bhattacharyya, and Sophorn Kim. “Angkor from the Outside In: Household Archaeology in Battambang Cambodia,” invited conference paper presented at the upcoming Shanghai Archaeology Forum in Shanghai, China, December 13-17, 2019


2. Outreach and Mentoring

a) Graduate students

<table>
<thead>
<tr>
<th>Student Name</th>
<th>Graduate Degree</th>
<th>Project Title</th>
<th>Anticipated Year of Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tiyas Bhattacharya</td>
<td>Tiyas is currently a 2nd year graduate student and beginning a project for her Master's Thesis (MS) in the Anthropology Department at the University of Oregon.</td>
<td>Title TBD. Tiyas will evaluate stoneware ceramics from our excavations (and other locations in Cambodia) in order to determine the kiln sites from where the pottery originated and investigate the internal trade of Angkorian stoneware ceramics over time and space.</td>
<td>2021</td>
</tr>
<tr>
<td>Patricia Cabrera</td>
<td>Master’s Thesis, University of the Philippines</td>
<td>Analysis of Faunal Remains from the Prasat Basaet excavations</td>
<td>2021</td>
</tr>
</tbody>
</table>

b) Community outreach
<table>
<thead>
<tr>
<th>Name of school, organization, or group</th>
<th>Education level</th>
<th>Participants local or non-local</th>
<th>Estimated number of participants</th>
<th>Details on contributions/ activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Royal University of Fine Arts (Phnom Penh) and Université des Moussons (France)</td>
<td>BA/MS</td>
<td>Local</td>
<td>1</td>
<td>As part of our 2019 field season, we welcomed one student (Sreyneath Meas) working on a combined Master’s/BA thesis on metal working at another site in Cambodia. She joined our project for the final few weeks to lend her expertise and is considering including our project as part of her planned PhD thesis.</td>
</tr>
<tr>
<td>Ministry of Culture and Fine Arts · Battambang Office</td>
<td>BA</td>
<td>Local</td>
<td>3</td>
<td>As part of our 2019 Field Season we had three junior staff members from the provincial Battambang Ministry of Culture and Fine Arts (MCFA) office (Sovisal Phorn, Sela Hoem, and Pethoeng Hoem) who participated in the entirety of our field season. Two members (Sovisal and Sela) had participated in our previous 2018 field season and therefore took on more responsibility and leadership roles, including supervising Earthwatch volunteers. They were also trained in using GIS mapping software and equipment to undertake a survey of the archaeological landscape around Basaet.</td>
</tr>
<tr>
<td>Ministry of Culture and Fine Arts · Phnom Penh</td>
<td>MS</td>
<td>Local</td>
<td>1</td>
<td>As part of our 2019 field season we welcomed an experienced fieldcrew member (Raksmey Muong) who recently completed a Master’s thesis at the School of Oriental and African Studies in London. Raksmey supervised trenches and helped train Earthwatch volunteers as well as organizing our Community Archaeology Day.</td>
</tr>
</tbody>
</table>

3. Partnerships

<table>
<thead>
<tr>
<th>Partner</th>
<th>Support Type(s)¹</th>
<th>Years of Association (e.g. 2006-present)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Culture and Fine Arts (MCFA)</td>
<td>Permits and collaboration</td>
<td>2018-Present</td>
</tr>
<tr>
<td>Royal University of Fine Arts (RUFA)</td>
<td>Collaboration</td>
<td>2018-Present</td>
</tr>
<tr>
<td>Australian Research Council (ARC)</td>
<td>Funding</td>
<td>2018-2020</td>
</tr>
<tr>
<td>University of Hawaii</td>
<td>Academic support</td>
<td>2018-Present</td>
</tr>
<tr>
<td>University of Oregon</td>
<td>Academic support</td>
<td>2018-Present</td>
</tr>
<tr>
<td>Hawaii/Wisconsin Luce faculty-student collaborative research fellowships for research in Southeast Asia</td>
<td>Funding</td>
<td>2019</td>
</tr>
</tbody>
</table>

¹ Support type options: funding, data, logistics, permits, technical support, collaboration, academic support, cultural support, other (define)

4. Contributions to management plans or policies

<table>
<thead>
<tr>
<th>Plan/Policy Name</th>
<th>Type²</th>
<th>Level of Impact²</th>
<th>New or Existing?</th>
<th>Primary goal of plan/policy³</th>
<th>Stage of plan/policy⁴</th>
<th>Description of Contribution</th>
</tr>
</thead>
</table>

² Type options: agenda, convention, development plan, management plan, policy, or other (define)

³ Level of impact options: local, regional, national, international

⁴ Primary goal options: cultural conservation, land conservation, species conservation, natural resource conservation, other (define)

⁵ Stage of plan/policy options: proposed, in progress, adopted, other (define)
5. Conserving natural and sociocultural capital

c) Conservation of taxa

i. List any focal study species that you did not list in your most recent proposal

<table>
<thead>
<tr>
<th>Species</th>
<th>Common name</th>
<th>IUCN Red List category</th>
<th>Local/regional conservation status</th>
<th>Local/regional conservation status source</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

ii. In the past year, has your project helped conserve or restore populations of species of conservation significance? If so, please describe below.

| Species          | IUCN Red List category | Local/regional conservation status | Local/regional conservation status source | Description of contribution | Resulting effect
<table>
<thead>
<tr>
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</tbody>
</table>

6. Resulting effect options: decreased competition, improved habitat for species, range increased, population increase, improved population structure, increased breeding success, maintained/enhanced genetic diversity, other

d) Conservation of ecosystems

In the past year, has your project helped conserve or restore habitats? If so, please describe below.

| Habitat type     | Habitat significance  | Description of contribution | Resulting effect
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
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</tbody>
</table>

7. Habitat significance options: nursery, breeding ground, feeding site, corridor, migration path, refuge, winter range, summer range, spring range, fall range or other (define)

8. Resulting effect options: extent maintained, condition achieved, restored, expanded, improved connectivity or resilience

e) Ecosystem services

Indicate which ecosystem service categories you are directly studying in your Earthwatch research and provide further details in the box below as needed.

Provisioning Services | Regulating & Support Services | Cultural Services
-----------------------|--------------------------------|------------------------|
- Fisheries (Fresh & Marine) | Carbon sequestration/storage/”blue” | Cultural/historical values |
- Energy (Fuelwood/hydropower) | Coastal protection | Health (mental & physical) |
- Livestock grazing | Erosion control | Research & knowledge |
- Material extraction (e.g. resin, grass) | Flood regulation/protection | Recreational |
- Timber | Pest and disease control | Spiritual/aesthetic values |
- Water supply | Pollination | Other Services |
- Other food (crops, wild foods, spices) | Seed dispersal | Biodiversity |
- Pharmaceuticals | Water purification/quality | Employment/Livelihoods |
- Pharmaceuticals | Nutrient cycling | |

Details:

f) Conservation of cultural heritage

Provide details on intangible or tangible cultural heritage components that your project has conserved or restored in the past year.

<table>
<thead>
<tr>
<th>Cultural heritage component</th>
<th>Description of contribution</th>
<th>Resulting effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artifacts</td>
<td>More than 300 kilos of artifacts were uncovered during our excavations. As part of our project, these collections have been carefully washed, photographed, and catalogued for final storage within the Battambang Ministry of Culture office.</td>
<td>The catalogue of artifacts is now available for ongoing and future archaeological scholarship.</td>
</tr>
</tbody>
</table>

9. Cultural heritage component options: traditional agriculture, artifacts, building(s), hunting ground or kill site, traditional ecological knowledge and practices, monument(s), oral traditions and history, spiritual site, traditional subsistence living
g) Impacting local livelihoods

Provide details on how livelihoods were impacted by your project. This includes persons hired to assist Earthwatch teams (field assistants, guides, cooks, drivers, etc.) and any economically applicable training provided to local community stakeholders.

<table>
<thead>
<tr>
<th>Local livelihood impact(s)</th>
<th>Description of contribution</th>
<th>Number of people impacted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field assistants</td>
<td>Our project hired local workmen to assist with our excavations. Several of these crew members worked with us in 2018 and are related to the landowners on whose land we worked.</td>
<td>7</td>
</tr>
<tr>
<td>Drivers</td>
<td>Our project hired local drivers to safely drive project volunteers and crew members to and from the site and to and from Siem Reap.</td>
<td>3</td>
</tr>
<tr>
<td>Landowners</td>
<td>We compensated local landowners for the use of their land as part of or project.</td>
<td>3</td>
</tr>
<tr>
<td>Ministry of Culture and Fine Arts employees</td>
<td>We paid an internship salary to our MCFA colleagues to support their participation in our project since they were away from their regular duties.</td>
<td>4</td>
</tr>
<tr>
<td>Experienced field crew members</td>
<td>We paid for experienced field crew members (based in Siem Reap) to join our project as supervisors.</td>
<td>2</td>
</tr>
</tbody>
</table>

h) Please provide any other measurable actions that you conducted within the local community(s) where your research takes place.

Our project also organized a Community Archaeology Day (described above). As part of this we produced an informational poster in Khmer describing archaeology, which was given to the local high school and local district office for more permanent display.

RESEARCH PLAN UPDATES

Report any changes in your research since your last proposal/annual report. For any ‘yes’ answers, provide details on the change in the ‘Details’ box. This section will not be published online.

1) Have you added a new research site or has your research site location changed? ☐ Yes ☒ No
2) Has the protected area status of your research site changed? ☐ Yes ☒ No
3) Has the conservation status of a species you study changed? ☐ Yes ☒ No
4) Have there been any changes in project scientists or field crew? ☒ Yes ☒ No

Details - provide more information for any ‘yes’ answers

Due to the "Hawaii/Wisconsin Luce faculty-student collaborative research fellowships for research in Southeast Asia" we were able to bring on a PhD Student from the University of Wisconsin-Madison (Richard Nicolas), a Vietnamese archaeologist (Thuy Nguyen) who works with UW-Madison faculty member Nam Kim, to join our project as interns. Through this funding scheme we were also able to bring Dr. Carmen Sarjeant (specialist in Vietnamese earthenware ceramics) to begin our earthenware ceramics classification system (described above).

5) Provide details on any changes to your objectives, volunteer tasks, or methods, include reason for the change.
The addition of these participants described above was opportunistic given the availability of this additional funding scheme.

ACKNOWLEDGEMENTS

- Mr. KIM Sophorn (Deputy Director, Ministry of Culture and Fine Arts Culture, Battambang) - Cambodian Project Partner
- Ms. Tiyas BHATTACHARYYA (PhD student, University of Oregon)
- Ms. Patricia Andrea CABRERA (MA student, University of the Philippines)
- Ms. Kendall HILLS (PhD student, University of Illinois at Chicago)
- Mr. HOEM Sela (Ministry of Culture and Fine Arts, Battambang)
- Mr. HOEM Pethoeng (Ministry of Culture and Fine Arts, Battambang)
- Mr. MUONG Chanraksmey (Ministry of Culture and Fine Arts, Phnom Penh)
- Ms. MEAS Sreyneath (MA student, Royal University of Fine Arts/Université des Moussons/INALCO, Project Manusstra)
Ms. Thuy NGUYEN (Institute of Archaeology, Hanoi)
• Mr. Richard NICHOLAS (MA student, University of Wisconsin)
• Mr. PHORN Sovisal (Intern, Pteah Cambodia)
• Ms. Kim RUF (PhD student, Cambridge University)
• Dr. Carmen SARJEANT (University of Oregon) - Ceramics Specialist
• Ms. Aleana BAYMAN (High School Intern, Honolulu, Hawai’i)
• Mr. SUY Pov (Fieldwork Coordinator)
• Mr. LONH Lay (Fieldwork Supervisor)
• Mr. NANG Sy (Driver and Field Crewmember)
• Mr. Sally (Ministry of Culture and Fine Arts, Battambang)
• Local workmen: Ban, Kosal, Ta, Kon, Saroath, Ponleu, Siang
• Our 2019 Earthwatch volunteers: Judith Bonner, Jane Burch, Kerry Cooper, Royanne Cruthers-Moon, Fred Dawkins, Mary Deheck, Christine Hart, Malorie King, Yuran Niu, Jessica Sinha, Sonya Sinha, and Caroline White.

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Vickery, Michael

Wolters, O W

Anything else

Our project website can be found at: https://sites.google.com/view/pteah-cambodia/home