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New Ceramic Data from East Kalimantan: The cord-marked and red-slipped sherds of Liang Abu's layer 2 and Kalimantan's pottery chronology

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ABSTRACT

Archaeological research in the Liang Abu rock shelter (East Kalimantan) led to the discovery and analysis of a pottery assemblage including red-slipped, cord-marked and incised pottery sherds, radiocarbon dated to 1672 ± 21 BP and 1524 ± 22 BP. In order to discuss our findings we undertake a reappraisal of the pottery material and associated radiocarbon dates from archaeological sites on Borneo Island, which provide us with an appropriate framework for a comparative analysis. This allows us to include the inland region of Kalimantan in the technological network of Neolithic Island South East Asia.

Keywords: East Kalimantan, Pottery, Radiocarbon, Austronesian, Liang Abu

INTRODUCTION

Since 2003, a French-Indonesian archaeological research project, coordinated by the National Research Center for Archaeology (Indonesia) and the University of Toulouse (France), has been developed in the karstic region of East Kalimantan (Mangkalihat Peninsula, Indonesia) to investigate human occupation processes during prehistory. Numerous surveys have led to the discovery of more than 50 caves and shelters, some with unique rock art paintings including Gua Saleh which dates back to at least the Early Holocene (Plagnes *et al.* 2003; Chazine *et al.* 2010). Recent excavations have targeted Liang Jon (Chazine and Ferrié 2008) and Liang Abu rock shelters (Ricaut *et al.* 2011, 2012).

Within the context of debates about the population history of Island South-East Asia (ISEA), the Kalimantan region remains poorly documented and understood.

When authors mention this region it is usually with regard to its strategic location facing the Wallace line on the edge of Sundaland, as a gateway from Sunda to Sahul during the late Pleistocene period, or as part of models of the diffusion of the Neolithic cultural complex from Taiwan and the Philippines and the Malay Peninsula. Such discussions lead us to expect that archaeological investigation of Kalimantan will provide new data that may lead to the reappraisal of the role of this region during Holocene prehistory and the associated cultural and population diffusion processes.

This article presents and discusses some preliminary results from the excavation of the Liang Abu rock shelter in East Kalimantan, based on the recovery and dating of red-slipped and cord-marked pottery. These data are firstly described, then compared with regional data and sites and, finally, the consequences of these occurrences for current archaeological models of cultural/population diffusion are discussed.

LIANG ABU ROCK SHELTER

Location and excavation

The Liang Abu site is located within the rainforest of a mountainous karstic area, 130 km north-west of the Makassar Strait shore (Figure 1; GPS location $01^{\circ}28'05.9''$ N, $117^{\circ}17'16.3''$ E) and 6 km from the remote Lebbo' village of Merabu (East Kutai, East Kalimantan, Indonesia). Liang Abu shelter is a vast and dry overhang facing east. Its di-

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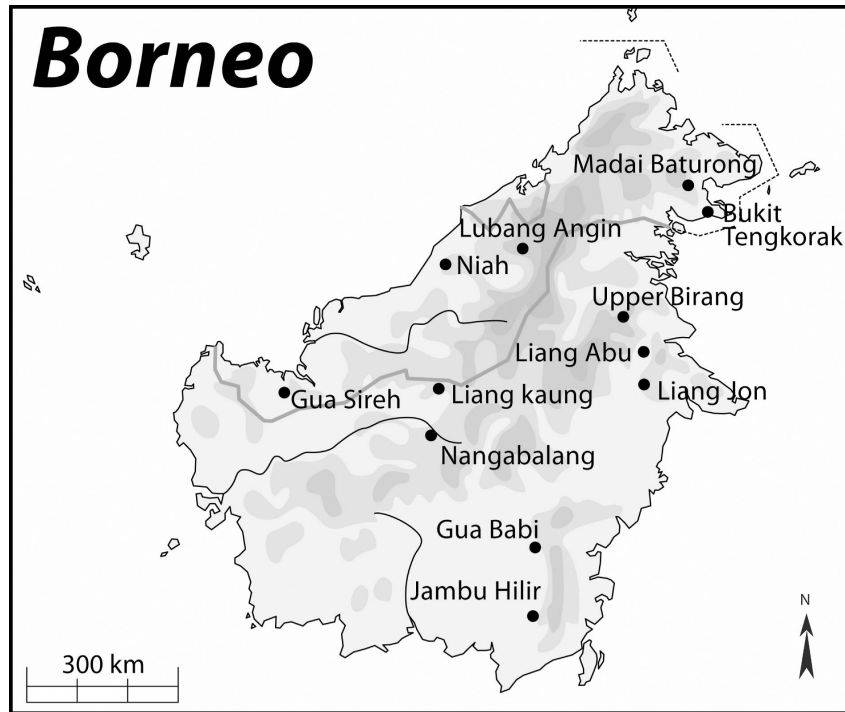


Figure 1. Location of Liang Abu and other sites mentioned in the text.

mensions are around 25 m in maximum length and between 5 and 8 m in width (Ricaud *et al.* 2011).

Four test-pits were opened in 2009 and a new excavation campaign was undertaken in 2012. More than 70 kg of archaeological material (lithics, beads, shells, faunal re-

mains), including 3 kg of pottery sherds were recovered and are currently under study. Eighteen stratigraphic units (US) were identified (Figure 2) and the bed rock was reached at a depth of ~160 cm below the modern surface. The presence of lithics in all of the levels seems to attest

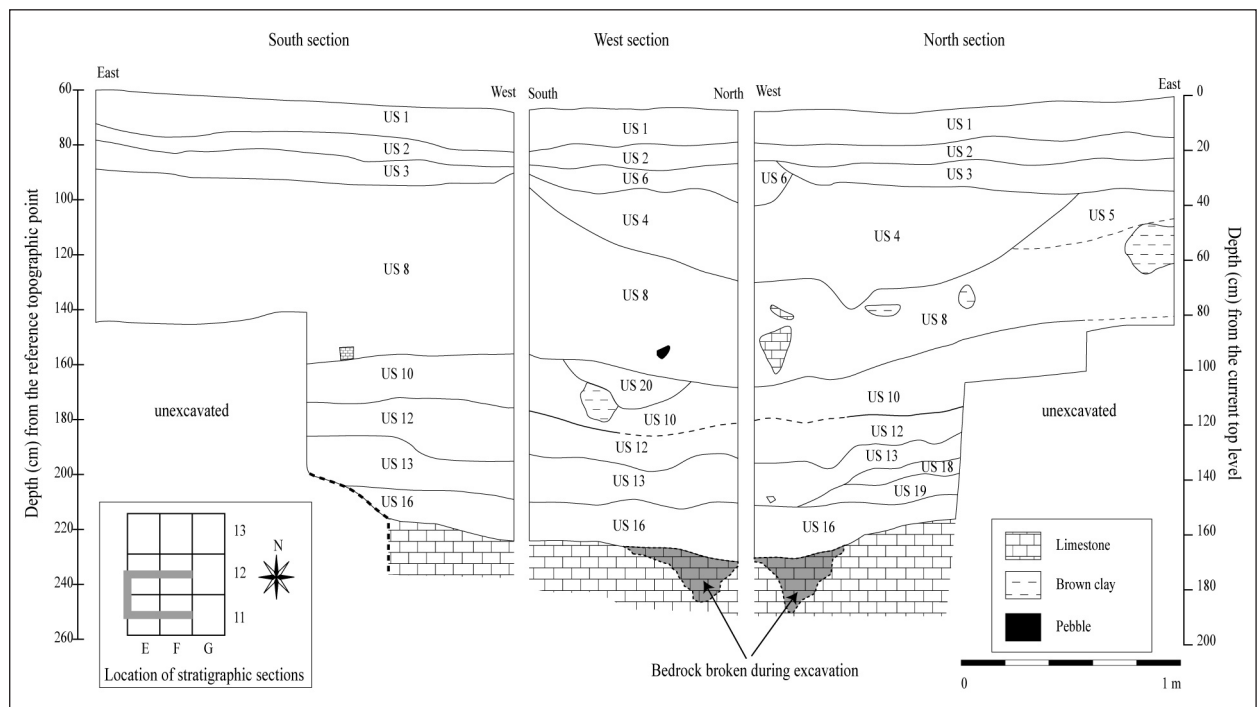


Figure 2. Stratigraphic sequence from square 12 (Liang Abu).

to human presence throughout the stratigraphy but the material is still under study. Four ^{14}C dates were obtained in 2012, two for US2, one for US10, and one for US12 (Table 1), and the results are consistent with the stratigraphy.

Layer 2

The pottery material was concentrated inside layers 1 and 2 (Figure 2: US1 and 2). During fieldwork in 2009, these layers were excavated at four different locations, covering 5 m² in total. During excavation in 2012 layers 1 and 2 were excavated on a surface of 3 m², and red-slipped and cord-marked pottery material was identified. This paper discusses the layer 2 material.

The first layer corresponds to the current surface circulation level and is approximately 8 cm thick with yellow-brown and very powdery sediment. This layer is disturbed by trampling and bioturbation, and contains bones, lithic material and ceramics.

Layer 2, lying directly under layer 1, is ~12 cm thick and is very rich in archaeological remains (fauna, lithics and ceramics). The sediment is brown and powdery, mixed with a large amount of fine gravel. No geoarchaeological analysis has yet been conducted at Liang Abu, but we note that some authors have proposed two main explanations for this kind of sedimentary formation; it can result from bioturbation processes (Johnson 1993) or from alluvial erosion (Mercader *et al.* 2002).

Layer 2 is well-defined in stratigraphy, was easily perceived during the excavation and is the last layer to contain pottery. Moreover, the refitting of the sherd fragments (28 refitting units in total) is concentrated within layer 2, reinforcing the hypothesis of a homogeneous and coherent stratigraphic level. This is also supported by the two radiocarbon dates from charcoal sampled during the 2012 excavation, which gave two similar dates, one at 1672 ± 21 BP and the other at 1524 ± 22 BP (Table 1).

LIANG ABU'S LAYER 2 EARTHENWARE

General features

In total there were 554 sherds in layer 2, distributed as follows: 32 rims, 37 articulations (including determined and undetermined shoulder, carination and foot articulation) and 485 bodies. The assemblage was highly fragmented (average length 22 ± 7 mm). Thirty five percent of the sherds were decorated (impressed or incised). Although it was difficult to reconstitute whole profiles of the vessels, typological analysis identified four shape classes: cups, restricted vessels and two kinds of open vessels (classed according to angle of deviation from imaginary vertical axis: <45° and >45°). Pottery analysis is ongoing and a more detailed study will be provided in another paper. In the current paper we focus on specific types of earthenware: the few occurrences of red-slipped and cord-marked pottery.

Table 1. Radiocarbon dates mentioned in the text (calibrated using Oxcal 4.2.2, IntCal09 calibration curve) (Bronk Ramsey 2009; Reimer *et al.* 2009)

#	Site	BP	Sd	Code	Material	AMS δC	Cal.BP 2σ	Cal BC/AD 2σ
1	Liang Abu	1672	21	UBA-20839	charcoal	-32.5	1687-15287	AD 264-423
2	Liang Abu	1524	22	UBA-20840	charcoal	-41.2	1515-1349	AD 435-602
3	Liang Abu	12660	58	UBA-20842	charcoal	-20.7	15453-14570	BC 13501-12622
4	Gua Sireh	3850	26	CAMS-725	rice		4407-4156	BC 2459-2206
5	Gua Sireh	1480	260	CAMS-721	rice		1987-804	BC 50 - AD 1118
6	Gua Sireh	3990	230	ANU-7049	charcoal		5213-3731	BC 3314-1883
7	Gua Sireh	3220	190	ANU-7047	charcoal		3909-2930	BC 1974-1005
8	Liang Kaung	3030	180	ANU-8570	charcoal		3613-2779	BC 1668-834
9	Kimanis	1270	240	ANU-11311	charcoal		1691-699	AD 255-1223
10	Bukit Tengkorak	3360	190	ANU-10958	charcoal		4146-3083	BC 2201-1211
11	Bukit Tengkorak	2970	130	ANU-10963	charcoal		3442-2798	BC 1495-857
12	Bukit Tengkorak	2940	40	OZD-767	charcoal		3239-2693	BC 1291-1014
13	Liang Jon	2665	35	SacA-19317	charcoal	-29.1	2845-2744	BC 896-795
14	Lubang Angin	1650	90	CAMS 727	bone		1809-1350	AD 141-600
15	Lubang Angin	1960	90	CAMS 728	bone		2146-1706	AD 197-245
16	Lubang Angin	2200	120	CAMS 729	bone		2675-1891	BC 726-60
17	Niah	3175	105	GX-1428	charcoal		3676-3080	BC 1731-981
18	Jambu Hilir	2922	45	Wk-22009	charcoal		3240-2930	BC 1291-981

Note. For each radiocarbon dating the uncalibrated value is given in the text.

The red-slipped and cord-marked sherds from Liang Abu's layer 2

Three red-slipped sherds were found in different excavated squares (Figure 3). However, a detailed observation of the sherds suggested that they were originally from the same

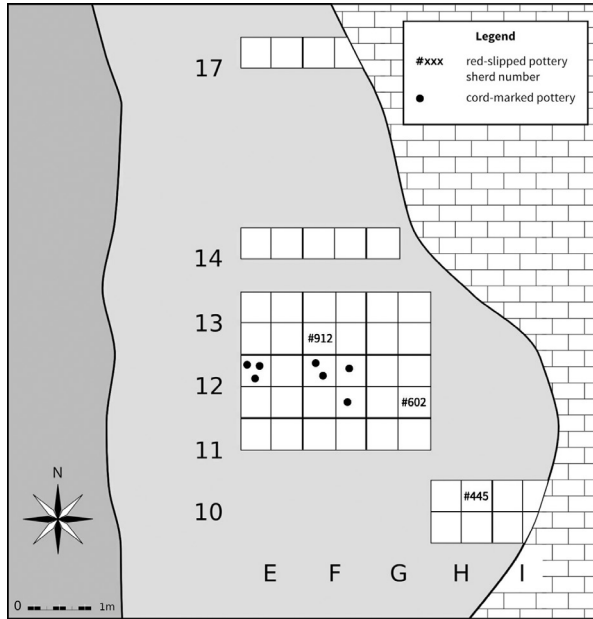


Figure 3. The distribution of red-slipped and cord-marked pottery in Liang Abu.

pot. Three technological descriptions led to this suggestion. Firstly, on the surfaces of the sherds smoothing traces covered by slipped and polishing traces were observed, on the inner and outer surfaces. The outer surfaces were red-slipped and the inner surfaces had a brownish-slip. Secondly, traces of unstable oxydo-reduction cooking at atmosphere were observed in the sherd sections. Thirdly, although it was impossible to reconstitute the vessel's whole profile, morphological features of the three sherds conform to a restricted and, perhaps, footed vessel. Sherds no. 602 and no. 912 are perpendicularly double-curved, which suggests a necked or footed vessel form. Sherd no 445 can be considered as a rim or a foot, with a diameter of 15cm (Figure 4).

The seven cord-marked sherds were found in squares 12E and 12F (Figure 3). They were all small pieces (length average: 24 ± 6 mm) and different kinds were observed. Examples of red-slipped and cord-marked sherds from Liang Abu's layer 2 are shown in Figure 5.

DISCUSSION

For decades pottery has been used as an essential material to define models of cultural and population dynamics in Island South East Asia, and in particular to define the so-called Neolithic diffusion (Solheim 1967; Bellwood 1997; Miksic 2003; Wibisono 2006; Spriggs 2007). The idea of a 'Neolithic kit' is still a commonly adopted perspective, but it involves some degree of speculation. Here we simply focus on the data and reassess the red-slipped and cord-

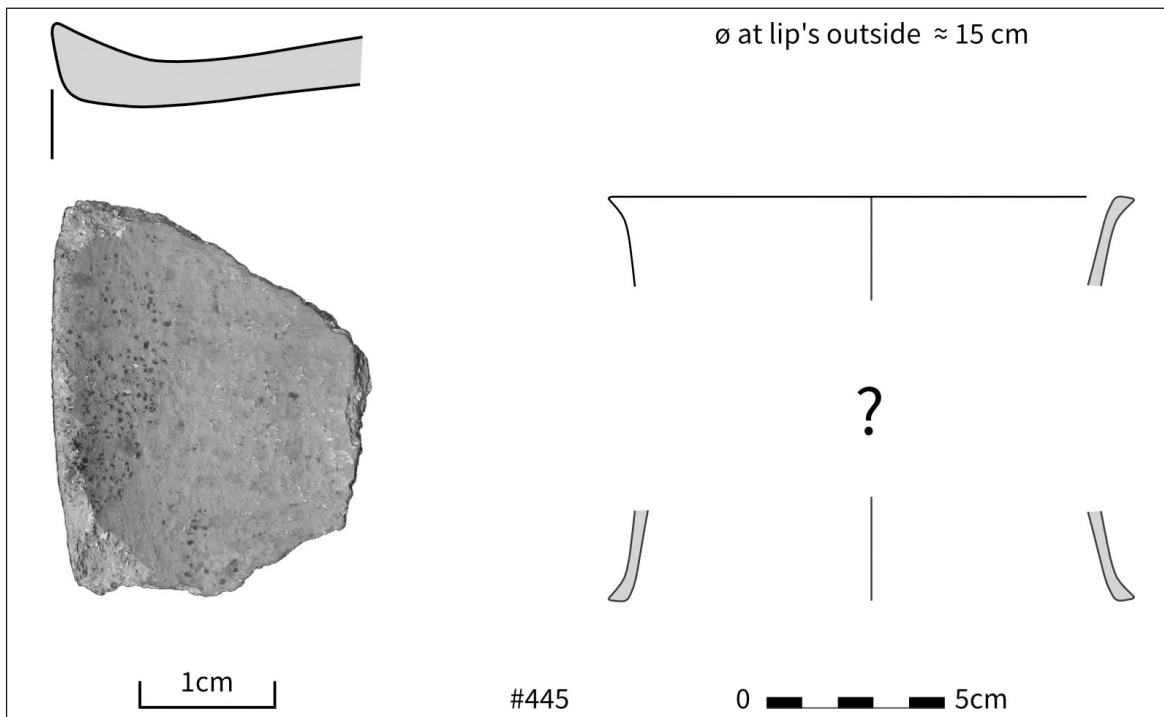


Figure 4. Potential footed vessel from the three red-slipped sherds from Liang Abu.



Figure 5. Red-slipped (bottom) and cord-marked pottery (top) example found in Liang Abu.

marked pottery of Kalimantan. For all the archaeological sites mentioned in the text uncalibrated values for radiocarbon dates are given, and calibrated values are displayed in Table 1.

A reassessment of red-slipped and cord-marked pottery presence in Kalimantan

Sites on the western side of the Müller mountain range

In the Niah Cave in western Borneo (Sarawak), there is no presence of red-slipped pottery in the earliest phase of the Neolithic (Barker 2005), Cord-marked pottery has been associated with charcoal dated at 3175 ± 105 BP. The situation at Gua Sireh (Datan and Bellwood 1991) is un-

clear: during their 1989 excavations, Datan and Bellwood found only two red-slipped sherds, but they noted that the excavation by Solheim in 1959 had unearthed many such sherds. However, due to the absence of associated stratigraphic data this information should be treated with caution. Furthermore, cord-marked pottery at Gua Sireh has been dated at 3850 ± 260 BP and 1480 ± 260 BP from an AMS-dated rice grain, and 3990 ± 230 BP and 3220 ± 190 BP from charcoal (Datan and Bellwood 1991).

More inland in Kalimantan, the two sites of Liang Kaung (East Kalimantan, Chazine 2003) and Nangabalang (West Kalimantan, Arifin 2006; Wibisono 2006) present the same pattern as other western/northern Borneo sites, as suggested by the pottery and dating obtained. Indeed, in both sites there is an absence of red-slipped pottery but a presence of paddle impressed pottery, dated at 3562–2964 calBP (conventional ages not given) at Nangabalang, and dated at 3030 ± 180 BP at Liang Kaung from a fire hollow under a cooking pot base. In addition, the pottery in Nangabalang has been noted to be relatively similar to those from the Niah Cave.

In Lubang Angin (Sarawak) there is no red-slipped pottery, but many three-colour ware and cord-marked pottery, and the rarer incised and carved-paddle impressed pottery (Datan and Bellwood 1991). Based on AMS-radiocarbon dates of 1650 ± 90 BP, 1960 ± 90 BP and 2200 ± 120 BP from human bones, the authors assert a chronological range of 1000 BC–500 AD for this assemblage. Recalibration of these dates indicates a later range of calBC 357 calAD 601.

Sites on the eastern side of the Müller mountain range

In Madai Baturong (Sabah, Malaysia) Bellwood (1984, 1988) detected the presence of a Neolithic phase (dated at 4000–2500 BP by radiocarbon and thermoluminescence, but no reference is given) and an early metal phase at 200 BC–1000 AD. Red-slipped pottery is present in both phases and is characterized by paddle impressions for the Neolithic phase and incised marked pottery for the metal phase.

At Bukit Tengkorak (Sabah, Malaysia) Chia (2003) distinguished three ceramic phases. The earliest phase (4340–1285 BC) contains red-slipped and plain pottery. Around 1200 BC, the middle phase (1200–900 BC) includes geometric and paddle impressed motifs. Incised and impressed vessels are also present. The last phase (900–50 BC) has the same features. According to Chia, impressed and incised sherds were not more than 7% of the whole assemblage. The red-slipped and plain vessels occurred throughout the stratigraphy. Spriggs (2003) has published three dates related to these levels: 3360 ± 190 BP, 2970 ± 130 BP and 2940 ± 40 BP, based on a personal communication by Bellwood, suggesting that the pottery assemblage appears very early. However, once calibrated, these dates do not coincide with the chronological phases proposed by

Chia (2003), as they are from the very end of the earliest phase (Table 1: using the combining function provided by OxCal 4.2.2, cumulation of the two last dates gives a probability range of 1291–1017 BC). Furthermore, Spriggs pointed out that less than 1.5% of the sherds came from the expected earliest level. So, there are no clear and robust relationships between the dated samples, stratigraphical units and the pottery units. The dating of Bukit Tengkorak's assemblage is still debated and periodization of its features remains ambiguous (Spriggs 2003).

The Upper Birang sites (East Kalimantan) are among the closest sites to Liang Abu, but no red slipped pottery was recorded (Arifin 2004). On the Kimanis site there is a date at 4650 ± 90 BP from spit 11, but not directly associated with the presence of pottery. The only reliable date associated with pottery is from a piece of charcoal from test pit C4, spit 8 (1270 ± 240 BP), knowing that 58 sherds were found in test pit no 4, between spit 10 and 3, and only 6 sherds are decorated with a ribbed-motif, which is similar to those from Liang Abu. In Lubang Payau cord-marked pottery have been found but, unfortunately, in a layer not dated directly. The underneath layer is dated at 4610 ± 110 BP, and provides an excessively loose *terminus post quem*.

Liang Jon (East Kalimantan), located along the Marang River (GPS location $01^{\circ}3'52''N$, $117^{\circ}16'24''E$), has provided important pottery material (1912 sherds recorded, Chazine and Ferrié 2008) and the analysis of this site is ongoing. However, we note that the upper level of the two trenches (A and B) excavated in 2007 provided incised, impressed and cord-marked sherds but these levels were disturbed. The 24 red-slipped sherds were found deeper and isolated in another trench (C), directly on a limestone floor. These red-slipped sherds were found alone, without the presence of any other pottery type. A piece of charcoal embedded in the limestone was dated at 2685 ± 35 BP (Table 1, Gay 2010), which indicates a *terminus post quem* to this assemblage. The relationship between the red-slipped sherds and the limestone is strengthened by presence of calcification on the sherds' surfaces.

Liang Jon's red-slipped pottery has similar features to those pieces found in north-east Borneo (Bukit Tengorak, Madai Baturong): flat rim, footed vessel, restricted and carinated forms (Figure 6). Based on the rims collected, we deduced that the sherds belong to at least two vases. Analysis of this assemblage is still ongoing.

Two sites are located in south Kalimantan. At Gua Babi (Widiyanto 1997) the pottery assemblage was highly fragmented. 23% of the sherds were decorated (paddle impressed and cord-marked, only one was incised) and some red-slipped pottery was present, but dates are not available (Arifin 2006). The Jambu Hillir site (Anggraeni and Sunarningsih 2008) provided a pottery assemblage which included red-slipped, incised and impressed pottery. Pottery was found throughout the test pit stratigraphy (90cm deep), but only spit 5 (depth 50–60 cm) has been dated. Unfortunately the two dates obtained are not coherent

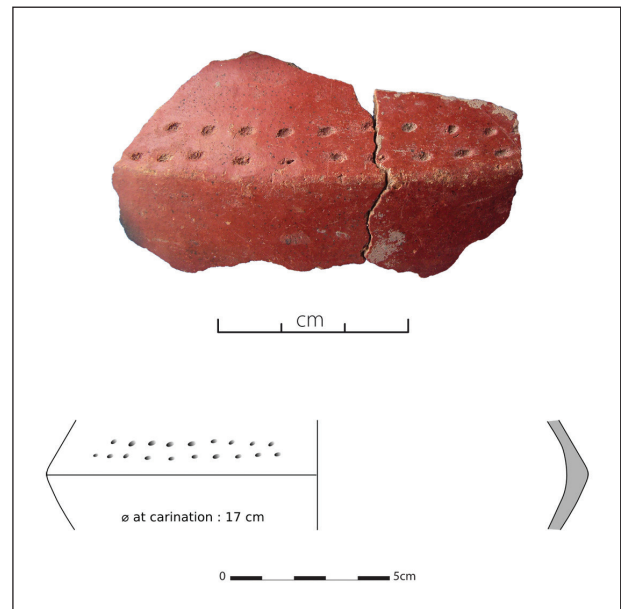


Figure 6. Red-slipped pottery from Liang Jon (East Kalimantan).

19427 ± 97 BP (Wk-22010) and 2922 ± 45 BP (Wk-22009). The authors excluded the first date and suggest that it is an effect of the redeposition of sediment by a nearby river. They note that the pottery assemblage is typical of that from the early Metal Age period – usually estimated between 500 BC and early centuries of the AD period – and consider the second date not incoherent, but older than expected for the metal age period. They prefer to accept the radiocarbon-based dating rather than the pottery style-based one, and suggest that the Jambu Hillir site should be the oldest date for a Metal Age site in Indonesia (Anggraeni and Sunarningsih 2008).

Diffusion and alternative models

In his broad literature synthesis Spriggs (2007) discusses the diffusion of pottery material in Island South East Asia, and summarises current debates about the possibility of two independent cultural complexes moving into ISEA, both having left traces in Borneo.

The dominant model, proposed by Bellwood (2007), suggests a southward diffusion (i.e., Neolithization) from Taiwan around 4000 BP, which impacted the Philippines, the north of Borneo and Sulawesi between 3800–3600 BP, and then later spread into the Pacific. This movement was associated with the presence of red-slipped pottery in ISEA, the Austronesian languages, some specific cultural items (Gray and Jordan 2000; Bellwood 2005, 2007; Spriggs 2007) and some limited, but still debated, population movements (Solheim 2006; Bulbeck 2008; Wollstein *et al.* 2010; Karafet *et al.* 2010; Jinam *et al.* 2012).

A current debate focuses on a potential earlier movement coming from the Malay Peninsula to Sumatra, Java and Borneo (Spriggs 2007), which was initially supported by Bellwood (1997). At this time Bellwood clearly distinguished an early Malay vector, originating from Thailand, and a later Philippine vector, originating from Taiwan. The first vector would have been characterized by cord-marked pottery and the second vector by red-slipped and/or incised and impressed pottery. The assemblages from Gua Sireh (Datan and Bellwood 1991) and Niah (Barker 2005) in Sarawak are then related to those from Thailand and the western Malaysian Neolithic sites.

However, new data have disrupted this dual model, and Bellwood now associates the earliest cord-marked pottery from Borneo with the fine corded ware from Taiwan: this cord-marked pottery is also contemporaneous with the red-slipped pottery of the latest phase (Spriggs 2007). Consequently, cord-marked pottery would not have been an exclusive characteristic of the Thailand-Malay vector.

It is possible that the spread of pottery features into Borneo, in the early phase, and at least on the Malay side, was part of a different movement than the later one diffusing from Taiwan. The data acquired in East Kalimantan strengthens this idea.

To detect a clearer pattern of pottery diffusion in ISEA some authors have proposed a periodization, like Wibisono (2006) who suggests a style chronology of pottery at the scale of the whole of South-East Asia based on 3 periods: from ~4000 to 2500 BC, characterized by red-slipped pottery and illustrated by Bukit Tengkorak (Sabah), Dimolit and Musang (Luzon);

- from 2500 to 1000 BC, characterized by paddle-impressed pottery and illustrated by Gua Sireh (Sarawak);
- from 1000 BC, without mentioning a chronological termination to this phase, both characterized by a 'geometric style' and the co-occurrence of previous features (red-slipped, paddle-impressed). This phase is illustrated by Magapit site (Luzon).

This periodization is useful as a general framework, but is, however, unsatisfactory as it aims to describe the whole of Island South-East Asia from a few sparse sites from each chronological phase. A comprehensive periodization will be based on reliable observations from each area it aims to describe 'rather than forcing it into a preconceived scenario' (Bulbeck 2008). According to Wibisono's framework, Liang Abu's assemblage would correspond to the latest phase, with its especially broad definition. Such a description is useful, but it brings little relevant information, as Liang Abu's layer 2 dates are far more recent.

To avoid the weakness of Wibisono's framework we focus on pottery data from sites in a more restricted geographic area, the island of Borneo, which is bounded by the sea and physically divided by the Müller mountain

range. Like Bulbeck (2008) we employ an empirical approach, going back to the raw data. We propose an integrative periodization based on both radiocarbon dates and the evolution of pottery features in Borneo, using pottery data from Liang Abu, Liang Jon, and previously known sites in Borneo. Regarding the eastern side of Müller mountain range, the earliest phase is documented at Liang Jon and contains red-slipped but no cord-marked pottery. Bellwood and Dizon (2005) date the dispersal from Taiwan into the northern Philippines at about 2000 BC. Dating the penetration of corded pottery in Borneo is still controversial, as it is unclear if (fine) corded ware is present at Gua Sireh (Bulbeck 2008). Nevertheless, all the known sites on the eastern part of the Müller mountains are more recent compared to the northern and western sites. Therefore, Jambu Hillir's assemblage can be considered as prior to the (fine) cord-marked pottery in this area. Liang Jon's first phase could find a transitional place between Jambu Hillir and Liang Abu data. Liang Jon's assemblage is older than that at Liang Abu's and, coherently, it contains significantly more red-slipped sherds. Liang Abu presents an admixture of red-slipped, cord-marked pottery and a dominant percentage of incised and impressed sherds. This configuration is reliable with Bellwood's suggestion regarding Taiwan's fine corded ware: Liang Abu is interpreted as a testimony of a period back to the introduction of cord-marked pottery initially from Taiwan into the eastern side of Müller mountain range.

Nevertheless, we emphasize that we are dealing with few data related to pottery artefacts, which may explain why the Kalimantan region is not usually investigated in detail. Due to this we do not want to make general assertions concerning past population migrations, and moreover the data cannot support either Bellwood's (2007) or Solheim's (2006) models on the Kalimantan region.

Solheim (2006) dates a cultural expansion, beginning approximately 5000 BC, from coastal continental south-east Asia (Vietnam) to a region centered on Borneo, crossing this island from north to south (i.e. from his 'early central lobe' to 'late central lobe' Solheim 1996). This date is too old to be supported by the results we get in Kalimantan. However, Solheim's focus on settlement location within his *Nusantao* concept, gives us cause to reassess the relationships between coastal and inland archaeological sites.

Our reassessment of ceramic data from controlled stratigraphic contexts with absolute chronological information challenges what was supposed to be known about inland sites in Kalimantan. Arifin (2006), for instance, claims that Kalimantan's sites (albeit only those from Upper Birang and Gua Babi) are excluded from the 'well-developed maritime cultures in the north and north-east' (Arifin 2006: 158). Spriggs notes that in Kalimantan (and Palawan) 'pottery is cord-marked as opposed to the red-slip pottery derived from Taiwan' (Spriggs 2007: 112).

The data obtained at Liang Abu and Liang Jon lead

Table 2. Kalimantan sites with reliable and dated pottery assemblages

Site	Cal BC/AD 2σ	Cord-marked	Red-slipped
Liang Jon	BC 896–795	no	yes
Jambu Hilir	BC1291–981	no	yes
Liang Abu	AD 264–602	yes	yes
Kimanis (Upper Birang)	AD 255–1223	no	no

us to modify these assumptions. Indeed, the Kimanis site (Upper Birang) should be placed into the later phase of our periodization, corresponding to the absence of red-slipped pottery (Table 2). With this perspective, assumptions should be made based on the data provided from the investigations and not from the absence of data due to a lack of investigation. As demonstrated by our paper, there are no *a priori* reasons why the Kalimantan inland regions were not involved in the technological and cultural network diffusions. The network exchange perspective proposed by Bulbeck (2008) has opened an interesting orientation in ISEA archaeological studies: he calls for a rigorous reassessment of the available data and notably points out the need for further pottery analysis in the Kalimantan region. Our paper provides some insights into this direction.

CONCLUSION

The limitations of archaeological research in Borneo are that (i) it is mostly the northern Malaysian part of the island where archaeological excavations and data are available. The vast Kalimantan territory has few pottery assemblages described, published and usable for comparative analysis; (ii) most of them are fragmentary, sampled in disturbed context, poorly dated and understudied from a stratigraphic point of view.

A third difficulty is related to the archaeological interpretation itself. Szabó and O'Connor (2004) firmly pointed out that the spread of material and linguistic features, in the case of Austronesian expansion, has to be considered firstly and carefully as potentially different. If there are correlations they have to be established on rigorous comparative analysis. Our interpretation of the pottery data discussed above tries to follow this precaution and to not consider the material, linguistic or sociological dimensions *a priori* as equivalent.

Thus, concerning the archaeological data of Kalimantan and the neighboring area we should first limit ourselves to an understanding of the stratigraphic dynamic deposits and to an empirical analysis of the relevant remains. In this direction, this article has proposed a discussion linked to an old, but not yet solved question. Regarding the vast extent of the Kalimantan region, the data from Liang Abu and other sites are still relatively limited. We anticipate that this problem will be overcome when more

archaeological excavations are undertaken and study of the material is standardized to a high level. The pursuit of our research project in Kalimantan will lead us to gather more evidence during the forthcoming years.

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