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The use of Lapita pottery: Results from the first analysis of lipid residues

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ABSTRACT

Biomolecular and isotopic characterisation of absorbed organic residues have been performed on eight dentate-stamped and two plain Lapita potsherds from the site of Teouma, in Vanuatu. Lipid profiles associated with decorated pots are homogenous, suggesting that similar food types or mixtures of food types were placed in these vessels. This suggests a high degree of consistency in the use of Lapita decorated pots, irrespective of the morphological and stylistic variation of these vessels. Data obtained from single-compound isotope analysis are also not consistent with marine resources as potential food sources for Lapita vessels. The absence of such commonly consumed, ubiquitous and easily accessible resources in Lapita vessels suggests that these pots were not manufactured to be used for ordinary occasions and day-to-day food consumption. This is the first time tangible data related to the use of these vessels are provided to support this claim in addition to contextual inferences.

1. Introduction

The first human settlers in Remote Oceania are recognised in the archaeological record by a set of cultural and material traits gathered together under the encompassing concept of the Lapita Cultural Complex (Earle and Spriggs, 2015; Green, 1991, 2000; Kirch, 1997; Sand, 2010a; Sand and Bedford, 2010b; Sand et al., 2011; Sheppard, 2011; Sheppard et al., 2015). The geographic extent of Lapita occupation is known to stretch from the Bismarck Archipelago and the south coast of New Guinea in the west to Tonga and Samoa in the east (Kirch, 1997; McNiven et al., 2011; Skelly et al., 2014). Although it would be prejudicial to limit the complex entirely to its ceramic aspect (Green, 1990, 33), the most distinctive element of the Lapita Cultural Complex remains its decorated pottery, characterized by fine dentate-stamped designs. The presence of Lapita vessels across such a wide geographical area suggests that these dentate-stamped vessels held a certain status within the social organisation of these colonising groups. The consensus is that the dentate-stamped Lapita vessels were probably used in special contexts (ceremonial, non-secular) rather than being a domestic cookware implement (Best, 2002, 99–100; Spriggs, 2003, 205; Chiu, 2007, 257–260; Kirch, 2000, 102–106; Terrell and Welsch, 1997, 568). The main arguments supporting this idea are based on indirect contextual evidence from a number of Lapita sites, including the presence of decorated Lapita vessels in direct association with burials at the cemetery site of Teouma (c. 2940–2710 cal BP) in Vanuatu (Bedford et al., 2006; Bedford et al., 2010, 143). This article presents for the first time concrete data acquired directly from Lapita pottery from Teouma that clearly support this hypothesis.

The objectives of this paper are twofold:

I. To propose an analytical method able to gain insights into the social role of dentate-stamped ceramics by providing direct chemical evidence related to the original contents of these vessels. Previous attempts at analysing residues in Oceanic pottery have had limited success and/or targeted very specific aspects which hindered the widespread applicability of these techniques to archaeological assemblages (Hocart et al., 1993; Hill and Evans, 1989; Fankhauser, 1997, 1994; Hill et al., 1985). Until now, *direct* evidence of Lapita diets have been provided by i) bulk stable isotope analysis of human bone collagen (Kinaston et al., 2014a, 2014b; Valentin et al., 2010; Valentin et al., 2014), ii) the analysis of starch and phytolith microfossils in dental calculus (Horrocks et al., 2014), and iii) starch

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and phytolith analyses of pottery residues (Crowther, 2009, 2005; Horrocks et al., 2009). Those studies have contributed significantly to scholarship but have important limitations when trying to reconstruct the use of Lapita pottery. Bulk stable isotope analysis of human bone collagen and the study of microfossils present in dental calculus of Lapita individuals provide direct evidence of the foods eaten by past people, but nothing indicates whether these foods were processed, cooked, stored, or displayed in Lapita vessels before being consumed. The analysis of starch and phytolith microfossils in soil adhering to sherds or preserved in carbonized deposits still adhering to the walls of ancient Lapita pottery have great potential for identifying precisely which plants have been processed or cooked in these vessels, but these techniques cannot be employed to document the use of animal resources. The biomolecular and isotopic analyses of lipids undertaken in the present study, on the other hand, shed light on a wider variety of food sources, including plant and aquatic oils, as well as animal fats.

This article details the results from the first organic residue analysis undertaken on Lapita pottery combining gas chromatography mass spectrometry (GCMS) and gas chromatography-combustion-isotope ratio mass spectrometry (GC-c-IRMS) analysis of lipids. When used in concert with stable isotope analysis of human bone collagen and faunal analysis, as we do here, these state-of-the art techniques in organic residue analysis have been shown to provide more accurate reconstructions of pottery use(s) than was traditionally possible (Craig et al., 2013; Craig et al., 2011; Craig et al., 2007; Craig et al., 2005; Outram et al., 2009; Reber and Evershed, 2006; Evershed et al., 1991; Taché and Craig, 2015). Absorbed residues were targeted in the analyses reported here, since none of the Lapita pottery sherds recovered at the site of Teouma had visible foodcrusts, or carbonized deposits, adhering to their interior walls. Absorbed residues result from the contact and subsequent absorption of a ceramic container's original content into its porous and permeable wall during use (Heron and Evershed, 1993). Such residues allow the identification of what has been placed in a vessel over its lifetime, as opposed to visible residues, which are usually formed from a single or a small number of cooking accidents that resulted in the carbonization of the vessel's content.

II. To test the hypothesis that the importance of Lapita dentate-stamped pottery had more to do with ideology (perhaps expressed in ceremony/ritual) than mundane use, with data directly acquired from the vessels via organic residue analysis. This idea that dentate-stamped vessels were not primarily used for cooking but rather for exceptional circumstances was suggested originally by Groube (1971, 305) and the detailed analysis of the dentate-stamped assemblages of Lapita sites in the Arawe (Summerhayes, 2000a) and Mussau Islands (Kirch, 1997, 120–122) in Papua New Guinea later suggested that “dentate-stamped vessels are one specialised component of a larger assemblage” (Summerhayes, 2000b, 301). If this hypothesis is today largely accepted, it still relies on inferences and has yet never been demonstrated by tangible data directly related to the usage of these vessels.

The rationale for conducting this study is that determining *what* was placed in these vessels has great potential to further our understanding as to *why* they were used. This project aims to determine what food items were placed in Lapita pottery in order to gain insights on the ways these vessels were used. By comparing data obtained from organic residue analysis of Lapita pottery with past study of soil microfossils, the composition of faunal assemblages, and current information on Lapita subsistence patterns and availability of resources, we hope to reveal whether commonly eaten food or unusual food items were placed in Lapita vessel. Established criteria employed to define ‘special types’ of food, such as rarity, difficulty of preparation and acquisition (labour investment), will also be considered to assess further the significance of these pots and determine whether Lapita vessels were special containers reserved for special occasions (Appadurai, 1986; Berry, 1994; Curet and Pestle, 2010; Dietler, 2012; Hayden, 1996),[1] or if they were more likely used in mundane day-to-day food preparations. Overall, the concept of Lapita cuisine has been little explored in the archaeological literature (cf. Kirch, 1997; Kirch and Green, 2001; Pollock, 1992) and this paper aims at beginning to fill this void.

2. Lapita pottery: the current consensus

The analysis of the decorative aspects of Lapita pottery has revealed that specific decorative motifs and quite rigid organisational rules were shared across a region covering 4000 km (Ambrose, 1997; Chiu, 2007; Mead, 1975; Sand, 2007; Siorat, 1990; Spriggs, 1990). Such a complex and organised decorative system implies that the iconography on the pots held an important cultural significance for the people who were manufacturing and using them. Current models assume that the cultural connection between Lapita communities, attested by the homogeneity of the dentate-stamped decorations across Lapita sites, was associated with ideology rather than materiality; ideas were transferred more than objects, and the ideological signification of these vessels was more important than their economic value (Earle and Spriggs, 2015). Accordingly, Best (2002), Chiu (2007) and Summerhayes (2000a) have argued that dentate-stamped Lapita ceramics, especially the ones displaying face motifs, were used to promote, signal and convey information about the social status and power of Lapita communities, notably in the contexts of special events and/or ceremonies (e.g., funerals, feasts, etc.).

Even if generally accepted, the idea that dentate-stamped ceramics were involved in special activities rather than prosaic domestic cooking relies on little information regarding how these vessels were used (see Kirch, 1997; Osmond and Ross, 1998). The general absence from Lapita pottery assemblages of soot or carbonized residues indicative of cooking (Kirch, 1997, 120–121; Kirch, 2000, 106), as well as the forms (notably the flat-bottomed dishes and the open bowls elevated on a pedestal) and technological characteristics of Lapita pottery have been used to suggest that these containers are not well suited to use directly over a fire (Ambrose, 1997; Clough, 1992). This was in turn interpreted to mean that dentate-stamped Lapita vessels were primarily used for food display/consumption rather than cooking. However, this does not exclude completely the possibility that Lapita pottery was also involved in certain forms of cooking, through indirect stone boiling for example, as suggested by the presence of foodcrusts on a very small number of Lapita vessels (Crowther, 2009, 2005) and Proto Oceanic reconstructed words for food preparation involving pottery (Osmond and Ross, 1998, 68; Lichtenberk, 1994, 275). Besides these technological and use-wear inferences, most of the arguments used to support the assumption that dentate-stamped Lapita ceramics were involved in ceremonial and/or ritual activities, as convincing as they might seem, rely on indirect contextual information, as detailed below.

i. The Talepakemalai (ECA) site (Mussau Islands, Papua New Guinea) represents one of the largest Lapita villages known and is noted for its well preserved spatial integrity amongst waterlogged deposits (Kirch, 2001; Kirch, 1997). Two distinct activity areas with contrasting assemblages have been identified on this 82,000m^2 site dating back to perhaps 1350 cal BCE at the earliest (Kirch, 1997; Kirch, 2001; Kirch et al., 2015, 50; Specht and Gosden, 1997,

[1] Many similar albeit not exactly comparable terms figure in the literature defining the type of food often consumed on special occasions: ‘high status’, ‘luxury’, ‘prestige’ and ‘elite’ food (Curet and Pestle, 2010; Szabo, 2001; Hayden, 2003; van der Veen, 2003). Each of these denominations carries a specific meaning regarding the social context in which they are consumed and their implications in terms of social and political power structure (Twiss, 2012). Because it is premature at this stage to address the significance of our results in terms of the social stratification of Lapita groups, we decided to use the encompassing term ‘highly valued’ foods, to qualify the content of the presumably prestigious dentate-stamped Lapita vessels.