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# New insights on the late Pleistocene–Holocene lithic industry in East Kalimantan (Borneo): The contribution of three rock shelter sites in the karstic area of the Mangkalihat peninsula

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ABSTRACT

This paper aims to present some aspects of the Late Pleistocene–Holocene lithic industry in the inland East Kalimantan region by studying the assemblages found in three rock shelter sites in the karstic area of the Mangkalihat peninsula. This study analyzes these assemblages in their regional techno-complex taking into consideration the environmental components. It focuses on certain aspects of stone flaking technology and the trends in the reduction sequences of the assemblages. Our results shows that the reduction sequences, flaking technology and the typology of the blanks and tools, persisted across the Pleistocene/Holocene boundary, as revealed in Liang Abu where the lithic artifacts were found throughout the stratigraphic sequence (over at least 20,000 years). Other excavations in Liang Jon and Liang Pemalawan have confirmed this continuity until the historical eras. In addition, this research emphasizes the potential influence of the environmental and climatic stability (persistence of the rain forest) during at least the last 40,000 years in this region, as well as the inland geographical location, on the continuity of the local stone flaking technology.



## 1. Introduction

Southeast Asia (SEA) is a huge geographical ensemble including continental and insular components. Despite numerous works (e.g., Van Heekeren, 1972; Glover, 1973; Bellwood, 1997; Simanjuntak, 1995; Forestier, 2000, 2003, 2007; Forestier et al., 2006b; Zeitoun et al., 2008; Borel, 2010), it remains difficult to propose an exhaustive techno-typological overview of, principally, *Homo sapiens*' lithic industry production in this part of the world. The evolution model of lithic industries which is applicable for sites in Western Europe cannot be applied to those in Southeast Asia, as shown by the study of some regional reduction sequences from the Late Pleistocene (Forestier, 2000). The rise in sea level during the Early Holocene gradually shaped the definitive coastlines of the current archipelago (Island South East Asia, i.e., ISEA) creating many islands which could have caused, according to some authors, a diversification of the lithic and bone industrial productions (Forestier and Patole-Edoumba, 2000).

The islands of Sumatra, Java (Forestier et al., 2010), Sulawesi, Timor and Flores, in particular, have many sites containing Late Pleistocene–Holocene lithic assemblages. Regarding the knowledge of the lithic production systems in SEA, Borneo Island looks like a *terra incognita* with the exception of a few coastal loci in its Malayan northern part, and a few others in the Indonesian part of Kalimantan (West, East and South Kalimantan). Despite a few works on the recent prehistory of Kalimantan for at least a decade, there is a real lack of data concerning the lithic industries.

This new insight aims to provide important data for understanding lithic production systems in this part of Island Southeast Asia (ISEA). This study will first approach the techno-economic

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behaviours of certain rainforest prehistoric populations in the karstic inland of East Borneo from Late Pleistocene–Holocene transition up to historical periods.

Our preliminary results raise a few important questions concerning particularly the reasons of the variability of the ISEA lithic productions and their technological continuity throughout the time despite, in certain cases, the succession of two different human species as the transition *Homo floresiensis*/*Homo sapiens* (cf. the case of Liang Bua in Flores, Moore et al., 2009) and according to insular geography in its palaeoenvironmental framework. Moreover, our study raises the underlying question of settlement patterns in this area since, at least, the LGM, as shown by some results from our datations, while this region is supposed to have been continually covered by tropical rainforest, since more than 40 ky (Barker et al., 2007; Cranbrook, 2010; Wurster et al., 2010). Finally, our study results introduce the issue of a neolithization (i.e. related to Austronesian expansion) in the East Kalimantan dense forest area (Fig. 1).

## 2. Study framework

### 2.1. Regional archaeological context

In Borneo, the Malayan area has been archaeologically rather well explored for decades as reflected by the Gua Sireh and Lubang Angin excavations (Datan and Bellwood, 1991; Datan, 1993), the Niah caves in Sarawak (Harrison, 1957, 1959; Barker, 2013), the sites in the Madai – Baturong mountains ranges, and Bukit Tengkorak in Sabah (Bellwood, 1984; Bellwood and Koon, 1989). In comparison, the Indonesian area which is the largest part of Borneo, remains relatively unexplored archaeologically, in the context of planned excavations with detailed stratigraphy and reliable dates, with the exception of a very few sites. The main sites from Kalimantan are located: (1) upstream of Kapuas River (West Kalimantan), such as Nanga Balang (Soejono, 1991); (2) Gua Babi (Widianto, 1997) and Gua Payung (Fajari and Kusmartono, 2013) in the Meratus mountains (Southern Kalimantan); (3) the sites of Kimanis, Liang Gobel and Lubang Payau on the upper Birang river (Arifin, 2004, 2006), in the region of Berau (East Kalimantan); and (4) the sites of the Keboboh caves complex (Jatmiko et al., 2004), Gua Tengkorak (Chazine and Ferrie, 2005), Gua Tebok, Gua Batu Adji, Gua Lungun (Gunadi, 2006), Liang Jon (Chazine and Ferrie, 2005, Chazine and Ferrié, 2008) Liang Abu and Liang Pemalawan (Ricaut et al., 2011, 2013; Plutniak et al., 2014) all located on the Marang and Jelai rivers in the karstic area of the Gunung Marang mountain range in the region of Sangatta, Mangkalihat peninsula (East Kalimantan) (Fig. 2).

### 2.2. Geological context: the karstic area of Mangkalihat

The Mangkalihat peninsula forms the extreme eastern point of Kalimantan (Indonesian part of Borneo). It faces Sulawesi and marks the northern end of the Makassar Strait at the entrance of the Celebes Sea. It marks the northern limit of the large sedimentary basin of Kutai. Geologically, it is essentially a blend of cenozoic (paleogene and neogene) sedimentary formations from marine and volcanic origin, dating from the Eocene (Muara Wahau region in the western part), the Oligocene (the central karstic area), to the Miocene (the coastal border of the peninsula; Wilson et al., 1999; Wilson and Moss, 1999; Cloke et al., 1999).

The karstic area itself belongs to an oligocene sequence limited in its western part by sedimentary formations, a combination of igneous rocks, various metamorphic rocks and cherts from the Mesozoic Cretaceous and Cenozoic Paleocene periods (Moss and Chambers, 1999). In this context, Mangkalihat has diverse geological, sedimentary, volcanic and metamorphic features which offer a large choice of knappable raw material (Fig. 3).

### 2.3. Archaeological fieldwork in three sites: a brief historical introduction

In 1988 a French speleological exploration, conducted by Fage (1989, 1994) and Fage et al. (2010), discovered prehistoric rock art in the catchment area of the Marang and Jelai rivers (on the western piedmont plain of the Gunung Marang Mountains). In 1992, a French archaeological mission in this area, conducted by J.M. Chazine, explored systematically a series of caves and rock shelters, some with wall paintings (Chazine, 1995). For eighteen years (1992 until 2010), J. M. Chazine conducted archaeological surveys site explorations and excavations in the Gunung Marang karstic area. Since 2011, archaeological fieldwork has been conducted in the framework of a scientific French mission called Archaeological French Mission in Borneo (MAFBO) under the responsibility of F.X. Ricaut. These studies revealed the significant potential of prehistoric archaeology in the karstic area of the Mangkalihat peninsula. Many sites are prehistoric human settlements containing pottery,


**Fig. 1.** Map of SEA and fieldwork area.

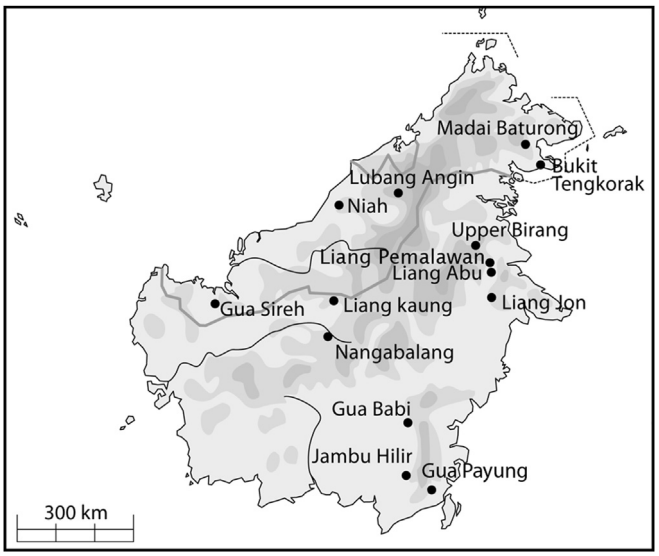


**Fig. 2.** Borneo main sites.

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