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New evidence of old stone tools from the Mekong terraces, Cambodia

Nouvelle preuve de la présence d'une industrie lithique ancienne sur les terrasses du Mékong au Cambodge

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ABSTRACT

The study of prehistoric sites with lithic remains indicates that the occupation of continental Asia, notably India and China, seems to have taken place earlier than previously thought. However, this Early Pleistocene human dispersal out of Africa remains debatable for the Southeast of Asia, in spite of the discovery of original lithic assemblages on the Mekong terraces dated to the very beginning of the Middle Pleistocene in the centre of Cambodia, by Saurin and Carbonnel in the 1960–1970s. Although this fundamental lithic material has become a reference, it has not been subjected to renewed study of these artefacts over the past decades, and it is thus not possible, for the moment, to attribute it with certainty to a particular culture. In this paper, we present an analysis of the raw materials and a techno-typological study of a similar series of prehistoric tools gathered by one of us in order to bring to light new elements concerning the first Palaeolithic occupation of this region of the world.

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RÉSUMÉ

D'après l'étude des sites préhistoriques qui ont livré des outils lithiques, le peuplement de l'Asie semble être plus ancien que ce qui était précédemment admis, du moins en Inde ou en Chine. Ce peuplement ancien reste, cependant, une question en suspens pour le Sud-est asiatique continental, alors que des hommes fossiles et outils lithiques anciens sont présents en Indonésie à une période très reculée. La découverte d'assemblages lithiques originaux par Saurin et Carbonnel dans les années 1960–1970 sur les terrasses du Mékong au centre du Cambodge, datées du début du Pléistocène, a servi de point de référence sans que ce matériel lithique ne soit réétudié depuis. En l'absence d'étude complète de ce matériel,

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il n'est pas permis de conclure définitivement sur sa nature ou son faciès culturel. Nous présentons ici une analyse des matières premières et une étude techno-fonctionnelle d'une série d'outils préhistoriques, trouvée par l'un d'entre nous (R.M.) dans le même contexte que celui décrit par Saurin, afin d'apporter de nouveaux éléments de réflexion quant aux premiers peuplements de cette région du monde.

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1. Introduction

In Cambodia, the long tradition of archaeological research instigated by French expeditions in the 19th century in continental Southeast Asia (Cartailhac, 1877, 1879; Finot, 1928; Jammes, 1894; Mansuy, 1902; Noulet, 1879) was interrupted by the tragic events of the 1970s. Keen interest in the conservation, restoration and architectural research on pre-Angkor and Angkor era monuments had long since eclipsed archaeological research on prehistory. Since 2009, with the renewal of excavations in the Laang Spean prehistoric cave, discovered in 1965 by C. and R. Mourer (1970, 1973) and Mourer et al. (1970), prehistory is at the forefront in Cambodia once again (Forestier et al., 2012; Zeitoun et al., 2012). Cambodia is located at the southern border of present day continental Asia, and with respect to the Indonesian island arc, corresponds to an emerged portion of "Sundaland", which intermittently linked this region to the present Indonesian island arc in a vast continental platform during the Pleistocene (Voris, 2000). It is extremely likely that very early traces of human activity are present in Cambodia, like those found in India (Pappu et al., 2011) and China (Boëda and Hou, 2011; Gao et al., 2005; Hou and Zhao, 2010; Hou et al., 2000; Huamei et al., 2008; Wanpo et al., 1995; Zhu et al., 2001, 2003), and in Indonesia on Java, or further west on Flores Island (Bartstra, 1976; Huffman, 2001; Jacob and Curtis, 1971; Larick et al., 2001; Morwood et al., 1998; Sémah, 2001; Sémah et al., 1992; Simanjuntak and Forestier, 2008; Swisher et al., 1994) (Fig. 1).

Geological prospecting on the Mekong terraces in Cambodia by E. Saurin and J.-P. Carbonnel in the 1960–1970s brought to light important elements of very early human activity. Their fieldwork resulted in the discovery of several prehistoric localities with cobble tools, over a stretch of about one hundred kilometers between Stung Treng and Kratie: Chhep, Sre Russey on the right bank of the Mekong, Sre Sbau, Kantuot and Khsim on the left bank in Kratie province (Carbonnel, 1972; Saurin, 1963a, 1966). One of us (R.M.) collected lithic artefacts in the same areas between 1964 and 1969. In spite of renewed prehistoric research by Cambodian students, directed by G. Albrecht until recent years (Albrecht and Moser, 1996), no other discoveries have been made since then, apart from a knapped tool in silicified wood, which is mentioned in an introduction to Cambodian prehistory (Forestier et al., 2012).

The prehistoric locality of Sre Sbau is cited more often than others in the literature. This site is located on one of the four main Quaternary terraces of the Mekong, with a first estimated age of 0.78 Ma, which further reinforces the interest in a detailed description of this lithic material. The site was accurately recorded by E. Saurin, near the milepost 312, 1 km north of Sre Sbau on the N13 road (Saurin, 1963b) but the material collected by Saurin was not found in the collections and has thus not been studied since the 1960s. However the tools from the same stratigraphic context at Sre Sbau, collected by R. and C. Mourer, was deposited in the Phnom Penh National Museum in 1972. This collection, including artefacts from four different localities (Thalaborivat, Sre Sbau, Chhlong and Kratie), in the centre of Cambodia is studied in this paper (Fig. 2).

2. The oldest lithic tools in Mainland Southeast Asia

Lower and Middle Pleistocene sites have been recorded in Southeast continental Asia from Myanmar to Vietnam and from Thailand to Malaysia. It is therefore not surprising to find such sites in Cambodia. However, many of these lithic assemblages from open-air sites remain ill-defined, from both stratigraphic and technological viewpoints: several local names were initially assigned to them although they do not present any particular typo-technological traits. In this way, in Myanmar, the Anyathian industry has been defined in the Irrawaddy valley (Chakrabarti, 1997). The Early Anyathian is thus described in three geographically distinct phases. The earliest and oldest issued from lateritic Magwe deposits and Chaunket deposits east of Sale. In the second phase, the artefacts are associated with a ferruginous encrustation at Nyang-U, whereas the third phase comes from pebble formations from Magwe, Minbu, Yenangyaung, Chauk, Bagan and Pakokku (Fig. 1). These objects have been described as hand adzes, choppers, chopping-tools and scrapers. Silicified wood makes up 84% of the raw materials and has become a guiding raw material for the recognition of ancient industries in Asia, along with silicified tuff and pebbles (Movius, 1943).

In Thailand, the Fingnoian industry is named after the Fing Noi river (Van Heekeren, 1948; Van Heekeren and Knuth, 1967), in the West of the country (Fig. 1). Of the six surface finds collected by Van Heekeren during his detention by the Japanese army, only three remain, described by Movius (1948) as chopper core-tools, shaped by unifacial transversal flake removals. During surface prospecting in northern Thailand, Sorensen (1976) described a Lannathian industry, mainly comprising choppers, and partly shaped in silicified wood. In Lampang province, still in northern Thailand, several localities yielded lithic material attributed to a very Early Palaeolithic culture. In this way, Suchit Pitragool initially gathered six lithic artefacts in the Kao Pah Nam locality, which later inspired Sorensen (1976) to carry out prospecting south of Mae Tha, where more than 250 artefacts were collected (Sorensen, 2001). However, no illustrations or accurate locality information exist for these finds. Renewed prospecting in this region

Fig. 1. Localization of the sites indicated in the text.
Fig. 1. Situation des sites mentionnés dans le texte.

(Pope et al., 1981) led to the discovery of six other lithic tools (chopper and chopping-tool) (Keates, 2001) in South Mae Tha and at Ban Don Mun.

Although the stratigraphic context of these finds is not clear, all the lithics from Lampang are estimated to be more than 0.8 Ma (Pope et al., 1986). This age corresponds to the extrapolation of the age of regional basalts to a unique piece found in Ban Don Mun and to those discovered at Mae Tha. Sorensen (1981, 2001) contests the early age of this material and Zeitoun et al. (2013) question the relative position of these finds in relation to the basalt flow.

In Vietnam, the Xuan Lôc "bifaces" were discovered by Saurin (1963b, 1971) (Fig. 1). Later, the discovery of the controversial Nui Do artefacts in Thanh Hoa province (Ha, 1980; Pham, 1976) began to undermine the theoretical "Movius Line" (1948), which was deemed to be culturally rather than environmentally defined. The review of the material from Nui Do, Quan Yen and Nui Nuong as well as Xuan Lôc suggests that these lithic series are recent, and not Acheulian, as previously stated (Nguyen, 2008). This new interpretation corroborates the opinion of other researchers before Boriskovsky (1966; see also Pham and Luu, 1973, p. 20–22). Thus, the early age of the lithic industries from mainland Southeast Asia is not clearly established, and further fieldwork is indispensable. However, no revision of the osteological or lithic material is possible without the stratigraphic revision of the surrounding deposits together with a taphonomic study. To resolve the conflict arising from the diverging opinions of Pope (Pope et al., 1986) and Sorensen (2001) concerning the Lampang series, or to establish the age of the allegedly early fauna from Phnom Loang cave, near the southern coast of Kampot, geochronological studies are still needed. This latter cave was purportedly occupied by Palaeolithic hunter-gatherer groups, as it yielded bone tools issued from Pleistocene fauna (Carbonnel and Biberson, 1968). However, since Mourer's doubts concerning these finds (Mourer, 1977, 1994), no other artefacts of this nature have been collected or described, and the fauna has not been directly dated.

Unlike in the island of Java, which, in contrast to Cambodia, is rich in fossil human remains and provides a

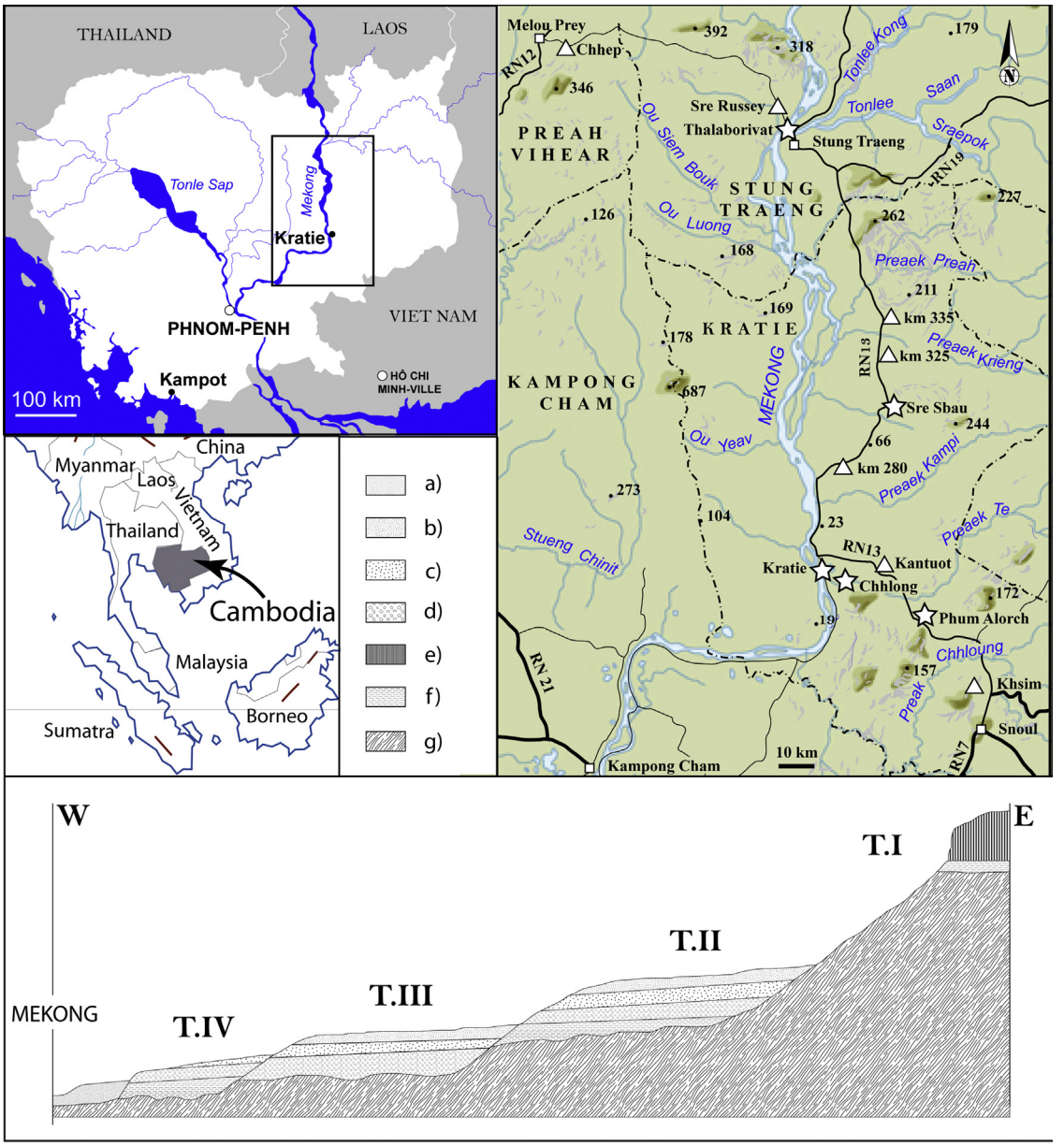

Fig. 2. Localization of the Palaeolithic localities with pebble tools in Cambodia: a: recent alluviums; b: pinkish sands; c: sand; d: pebble; e: basalt; f: clay/sand; g: Trias substratum.
Fig. 2. Localités paléolithiques du Cambodge avec des outils taillés : a : alluvions récentes ; b : sables rosés ; c : sable ; d : galets ; e : basalte ; f : argile/sable ; g : substrat du triasique.

consequent biostratigraphy, drawing up a chronology for Cambodia is a confusing and controversial exercise, considering the lack of well-dated key fossils (Langbroek and Roebroeks, 2000). Therefore any scientific controversy surrounding the nature of the lithic material must only be based on its detailed study. Obviously, it would make no sense to infer that artefacts are really artefacts or geofacts without such a study.

As for the lithic material from the Mekong terraces, Saurin (1963a) expounds the difficulties involved in identifying the material, given the context: "*These are flat oval-shaped pebbles, with oblique fractures, with a single removal, measuring 4 to 8 cm; some could be difficult to distinguish from pebbles broken naturally by transport, thermal factors or bush fires. Such pieces are however, widespread in primitive industries and at the sites of Phum Russey, Sre Sbau, Kantuot, Kompong Svayou. They are associated with more complex pieces: pebbles with several removals, backed pebbles half way around their diameter, paneled pebbles, and at Sre Sbau, a 'massive chopping edge' on a micaceous quartzite pebble flake*" (p. 259). In 1966, Saurin completed his descriptions and Carbonnel (1972) assimilated this industry into the one from the Fing Noi River in Thailand, described by Van Heekeren (1948) and Heider (1960).

Considering the history of prehistoric research in Cambodia, it is obvious that chronological and typo-technological uncertainties still surround the lithic material as superficially enounced with negative assertions without argument by Albrecht and Moser (1996) or Stark (2004). It is thus important to take into account the existence of irrefutably knapped pieces in collections. We thus propose to review the lithic material collected on the Mekong terraces by one of us (R.M.) in the 1960s, in order to shed light on crucial questions concerning the knapping of this material. This study is an indispensable preliminary stage before carrying out a morpho-structural and geochronological calibration of the material in the field.

3. The Quaternary terraces in Cambodia: the geological and chronological background

At the Dangrek mountain chain in the south of the Thailand boundaries, the Mekong River opens into the East Cambodian plain. This vast pediplain results from the erosion of the substratum of the Cambodian basin or former *Indosinias*. The age of these continental and sub-continental formations lies between the Moscovian and the Upper Cretaceous described by Fromaget (1934) and Saurin (1956). This surface is covered by fluviatile Quaternary formations. Alluvial terraces are particularly well represented on the left bank of the Mekong and fieldwork conducted between Stung Treng and Snoul (Carbonnel, 1972; Saurin, 1935a, Saurin and Carbonnel, 1964) led to the identification of four terrace complexes. These complexes lie at altitudes of 100 m (T.I), from 40 to 45 m (T.II), from 20 to 25 m (T.III) and 15 m (T.IV) above the Mekong at low water level (Fig. 2). They are made up of fluviatile deposits composed of detrital sediments: sand, silt and pebbles, which reflect strong variations in the flow rate of the river and its tributaries.

Terraces T.I and T.II have been affected by postdepositional phenomena of pedological origin: development of laterites and carbonatations (Saurin and Carbonnel, 1964).

Terrace T.II. contains coarse pebble formations. It is this sedimentary context which has yielded the most abundant lithic industry (Saurin, 1963a, 1966). Pebble petrography is mainly made up of filonian quartz, quartzite, laterite issued from the erosion of the terrace at 100 m, rare basalt and abundant rolled blocks of silicified wood. In a study of these fossil woods, Vozenin-Serra and Privé-Gill (1991a, 1991b) showed that the floral association contemporary with the Pleistocene deposits represents "a semi-humid forest covering vast surfaces in Southeast Asia since the Mio-Pliocene" (1991b) (p. 87). The sediments from terrace T.II have also yielded abundant tektites (Carbonnel, 1972; Fleischer and Price, 1964; Gentner et al., 1969; Saurin, 1935b, 1964, 1966). These indochinites are part of the dispersal of Australasian tektites and are considered to be in their original position by these authors. The direct dating of these tektites gives them an average age of 0.77 ± 0.02 Ma (Izett and Obradovich, 1992), which is usually considered to date the formation of the terrace T.II, and consequently, most of the associated collected lithic material, to the beginning of the Middle Pleistocene. Tektites have long been invaluable absolute dating elements for prehistoric sites in Southeast Asia, as for example in Indonesia (Von Koenigswald, 1957) or more recently in China (Hou et al., 2000). The Australasian region is characterized by the presence of a field of tektites known as the "Australasian Strewn Field" (Bunopas et al., 1999; Fontaine, 1976; Schneider et al., 1992), distributed over Australia, Madagascar and a zone stretching from the South of India to the South of China, with a slightly more recent age than the Brunhes/Matuyama limit. Since the first radiometric ages associated with these tektites (Izett and Obradovich, 1992; Schneider et al., 1992) and the stratigraphic calibration of the surrounding deposits (Tauxe et al., 1996; Wasson, 2003) provided an approximate age of 0.78 Ma, more recent chronostratigraphic calibrations suggest an age of 0.8 Ma (Giuli et al., 2000; Haines et al., 2004; Hou et al., 2000). This age further emphasizes the need to describe this lithic material, which is evidence of early prehistoric human presence in this region of the world. Nevertheless, it should be noticed that old raw material like tektites can be transported from older geological formations. The single case where the presence of tektites and radiometric ages are corroborated is at Mata Menge (Morwood et al., 1998).

4. Description of the Mourers' cobble tools collection (1968)

Given the small number of pieces ($n = 16$) at our disposal in this hitherto unpublished collection, it is more appropriate to present the tools individually, accompanied by their illustrations (Figs. 3 and 4) and their description rather than to attempt a statistical analysis. We nevertheless provide a table with common measurements (Table 1).

Suitable raw materials for knapping are abundant in Cambodia. There is a wide variety of volcanic rocks (rhyolite, andesite, trachyte, dacite, etc.), which represent about 20% of the rocks from the Mekong hydrologic Basin, but these materials were seldom used by prehistoric knappers. On the other hand, near Stung Treng, the Mekong drains the rivers Kong, San and Srepok, which transport sedimentary material from the South of the Annamitic chain (Sotham, 1997), which was preferentially used for tool-making. Thus, out of 16 confirmed stone tools gathered in the 1960s from the localities of Thalaborivat, Sre Sbau, Chhlong and Kratie, most of them are cobble tools and flakes issued from cobbles of sandstone, quartz, quartzite, but also a piece on silicified wood (Fig. 4, n° 2). The raw materials are local, as in most Early Palaeolithic Asian sites, where milky quartz, chert and pale fine-grained quartzite were used with silicified wood to create an active cutting-edge, as mentioned by Movius (1948). The 16 worked pieces from the collection do not just reflect a technical system of chopper and chopping-tool shaping, but also a basic core reduction system with alternating striking platforms, as shown by a core geared towards the production of cortical flakes (Fig. 4, n° 3) and also the use of big flakes as support (Fig. 3, n° 6 to 8 and Fig. 4, n° 4). Quartz and fine-grained quartzite predominate but artefacts in chert, a rare but valuable raw material for its knapping ability, indicate the capacity of Palaeolithic knappers to select appropriate raw materials. According to our xylological study indicating a diffuse porosity and isolated pores, with faint annual rings that have single rays, the fossil woods used to make

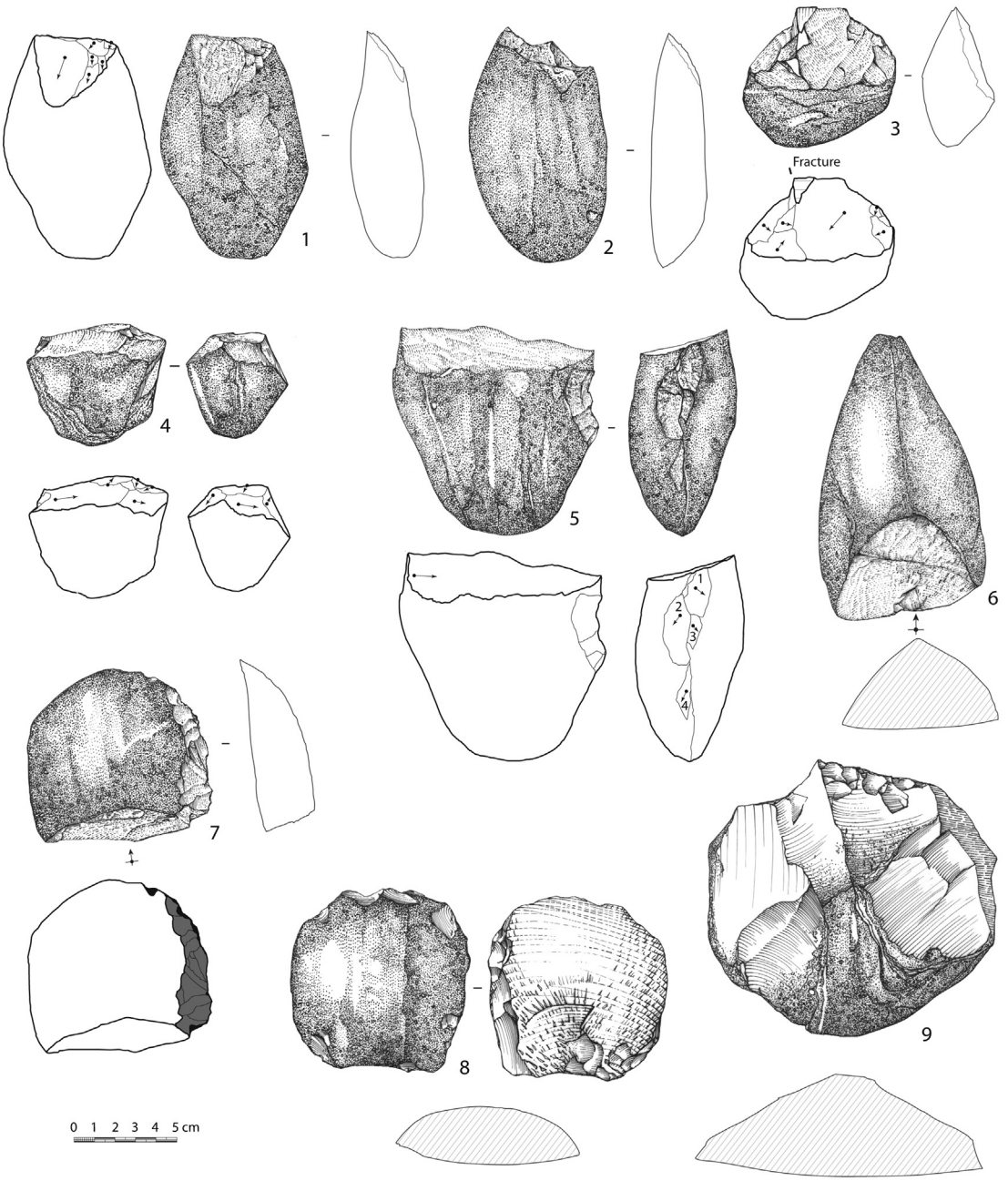

Fig. 3. Archaic surface finds from the locality of Thalaborivat: nº 1 to 3: distal chopper on a quartzite cobble; nº 4: chopping-tool on a quartzite cobble; nº 5: chopper with lateral retouch on a white quartz cobble; nº 6: flake-half pebble on a quartz cobble; nº 7: side scraper on a white quartz cortical flake; nº 8: retouched cortical chert flake; nº 9: massive chopper on a partly cortical chert cobble.
Fig. 3. Objets lithiques archaïques provenant de la localité de Thalaborivat : nº 1 à 3 : chopper distal sur galet de quartzite ; nº 4 : *chopping-tool* sur galet de quartzite ; nº 5 : chopper avec retouche latérale sur galet de quartz blanc ; nº 6 : éclat sur demi-galet de quartz ; nº 7 : racloir latéral sur éclat cortical de quartz blanc ; nº 8 : éclat retouché de chert ; nº 9 : chopper massif sur galet de chert partiellement cortical.

artefacts are heteroxyled woods that are probably dicotyledonous angiosperm taxon. North of the Mekong (Fig. 2), in the Stung Treng district, the most important locality is Thalaborivat, with 9 artefacts. Most of the tools are made of pebbles or cobbles of quartzite, white quartz and more rarely chert, such as a massive chopper on a block (Fig. 3, nº 9). None of the 9 pieces is over 15 cm long. Most of the tools are choppers and chopping-tools (Fig. 3, nº 1 to 5), but there are also several flakes struck from cobbles, including a milky white quartz flake with continuous retouch on the right edge (Fig. 3, nº 7). Flakes and thick half cobbles are also present and can attain large sizes, such as a piece (Fig. 3, nº 6) knapped by direct hard hammer percussion along the long cobble axis. All these flakes (Fig. 3, nº 6 to 8) bear

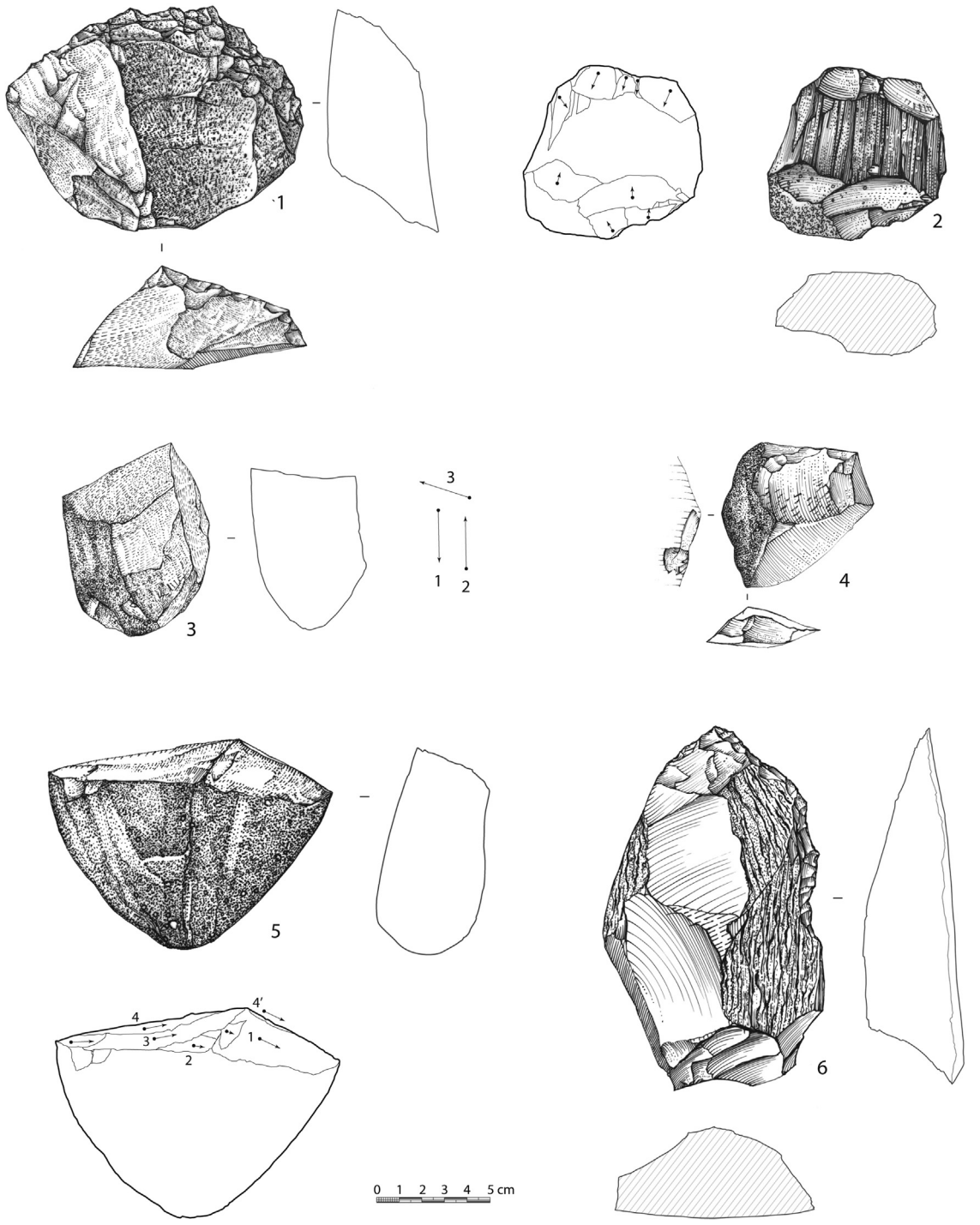

Fig. 4. Archaic industries from the localities of Sre Bau, Kratie and Chhlong: nº 1: massive chopper with a circular denticulated cutting edge on a quartzite cobble (Sre Bau); nº 2: tool on silicifed wood with bifacial retouch (Sre Bau); nº 3: core on a quartz cobble (Sre Bau); nº 4: quartzite flake with facetted butt (Sre Bau); nº 5: chopper on a quartzite cobble (Kratie); nº 6: unifacial tool on a chert block (Chhlong).

Fig. 4. Industries archaïques des localités de Sre Bau, Kratie et Chhlong : nº 1 : chopper massif avec un tranchant denticulé circulaire réalisé sur galet de quartzite (Sre Bau) ; nº 2 : outil sur bois silicifié avec retouche bifaciale (Sre Bau) ; nº 3 : nucléus sur galet de quartz (Sre Bau) ; nº 4 : éclat de quartzite avec talon facetté (Sre Bau) ; nº 5 : chopper sur galet de quartz (Kratie) ; nº 6 : outil unifacial sur bloc de chert (Chhlong).

Table 1
Measurements of the archaic cobble tools from the different Mekong terrace localities.
Tableau 1
Mesures des outils lithiques archaïques provenant des différentes localités des terrasses du Mékong.

Location	Type of artefact	Length	Width	Thickness (cm)
Thalaborivat 1	Chopper	11.0	7.2	3.5
Thalaborivat 2	Chopper	11.4	6.7	2.6
Thalaborivat 3	Chopper	6.8	7.4	3.5
Thalaborivat 4	Choping tool	6.0	6.7	4.9
Thalaborivat 5	Chopper	10.0	10.0	5.2
Thalaborivat 6	Flake	13.9	7.5	4.4
Thalaborivat 7	Side craper	7.4	8.7	2.9
Thalaborivat 8	Retouched flake	8.9	8.5	2.8
Thalaborivat 9	Massive chopper	13.4	13.9	4.9
Sre Bau 1	Massive chopper	10.2	13.5	4.5
Sre Bau 2	Tool in silicified wood	7.8	7.3	3.7
Sre Bau 3	Core	8.9	6.6	4.9
Sre Bau 4	Flake	8.3	7.9	2.3
Kratie 1	Chopper	7.3	9.8	3.6
Chhlong 1	Unifacial tool	16.7	10.1	4.1
Thalaborivat 10	Retouched piece	14.9	6.2	2.2
Alorch 1	Core	10.9	6.8	4.9
Thalaborivat 11	Chopper	12.3	11.1	5.8
Alorch 2	Chopper	7.6	6.2	3.1
Thalaborivat 12	Pointed chopper	12.9	10.4	6.1
Alorch 3	Tool on silicified wood	8.8	6.0	2.1
Phum Roloch	Tool on silicified wood	10.3	5.7	1.8

a totally cortical dorsal face, which proves that the core reduction sequence was short, fast and elementary, aiming at the production of large, heavy and thick blanks.

The Thalaborivat series provides information concerning two associated themes: the raw material that is selected (no calcareous cobbles, which are the most numerous in the deposits, are knapped) and the processing sequence, which is double, *id est* shaping method and flake production. The choice of the original shape of the cobble indicates a capacity to predetermine the end product of the production scheme.

Located between the Stung Treng and Preah Vihear districts, the site of Sre Sbau has only yielded 5 pieces, including a heavily blunted flake, which is not illustrated here. The pieces from this site are emblematic of the known characteristics of early Asian industries. We observe the joint occurrence of two technical systems of shaping and core reduction. The most remarkable piece is a chopper (Fig. 4, n° 1), with a classic morphology: the upper face of this tool, on a thick and heavy quartzite cobble, has been shaped to delimit a circular, denticulated, protruding cutting edge, with scalar retouch. Another marker tool from the Early Palaeolithic is an artefact made of silicified wood (Fig. 4, n° 2). It can be described as a shaped bifacial tool, of which both ends have been regularly rounded by abrupt retouch. It is made on a quadrangular fragment of stone, selected for its shape; it looks like the archaic tools of the Burmese terraces described by Movius in the 1940s.

At Sre Bau, a core of fine-grained quartzite (Fig. 4, n° 3) is proof of a simple debitage, which consists of alternating flake production surfaces (the striking platform numbered from 1 to 3). There is also a flake of fine-grained quartzite (Fig. 4, n° 4) with a facetted butt to illustrate this simple debitage.

The last two localities are Kratie and Chhlong, in the district of Kratie where the River Chhlong flows. Two tools

Fig. 5. Tool made on silicified wood from the region of Kratie (Phum Roloch village), reported in 1996 by H.E. Chuch Phoeurn and G. Albretch.
Fig. 5. Outil sur bois silicifié indiqué en 1996 par H.E. Chuch Phoeurn et G. Albretch comme provenant de la région de Kratie (village de Phum Roloch).

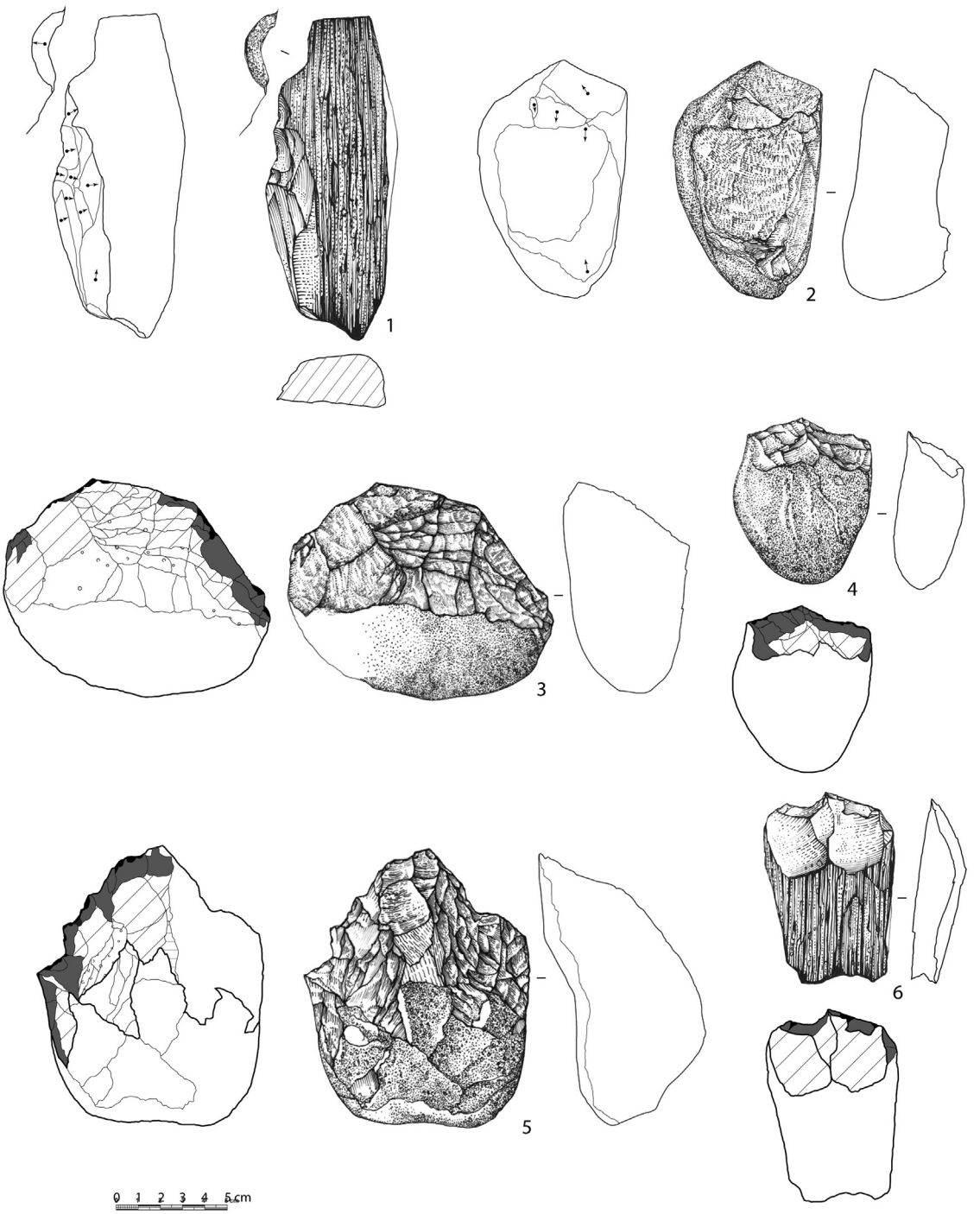

Fig. 6. Archaic pieces newly discovered from the localities of Alorch and Thalaborivat: nº 1: elongated rectangular silicified wood retouched on lateral side with an invert notch (Thalaborivat); nº 2: cobble used/tested as a core (Alorch); nº 3: chopper with a large convex cutting edge on a quartzite cobble (Thalaborivat); nº 4: chopper on a quartzite cobble (Alorch); nº 5: pointed chopper (convergent cutting edge) on a quartz cobble (Thalaborivat); nº 6: tool on quadrangular fragment of silicified wood (Alorch).

Fig. 6. Pièces lithiques archaïques nouvellement découvertes dans les localités de Alorch et Thalaborivat : nº 1 : bois silicifié allongé retouché latéralement avec encoche inverse (Thalaborivat) ; nº 2 : bloc testé (Alorch) ; nº 3 : chopper sur galet de quartzite avec grand tranchant ; nº 4 : chopper sur galet de quartzite (Alorch) ; nº 5 : chopper appointé (tranchant convergent) réalisé sur galet de quartz (Thalaborivat) ; nº 6 : outil réalisé sur fragment quadrangulaire de bois silicifié (Alorch).

from these localities can be described. The first is a chopper made from a quartzite cobble of medium size (Fig. 4, nº 5); and the second (Fig. 4, nº 6) is a unifacial tool on a partially shaped large chert block with a trapezoidal section, and a thick back. The convergent retouched edge is on the distal part of the tool.

The typological analysis of the material discovered in the 1960s on the Cambodian Mekong terraces confirms the anthropic character of these artefacts. The main morphological and typo-technological characteristics of the first Palaeolithic industries in Asia are present in the lithic series from the localities of Thalaborivat, Sre Sbau, Chhlong and Kratie, where raw material and cobble selection, with use of silicified wood, are similar.

5. Description of the new cobble tools collected in 2012

Following the reappraisal of the series gathered by C. and R. Mourer, we undertook a fieldtrip during summer 2012 in the locality of Kompong Svayou (in the province of Kratie), near the village of Phum Roloch, where a tool made from silicified wood was previously identified by H.E. Chuch Phoeurn and G. Albrecht in 1996 (Thuy, 2010 p. 30) (Fig. 5). During this excursion 6 new artefacts were recovered from the surface of the Mekong terraces at the Alorch and Thalaborivat localities (Fig. 6). No bifacial pieces were recovered during our short but non-selective fieldwork. By the way, the small collection does not allow us to make conclusions or to argue about the theoretical Movius' line, but these six new pieces confirm the earlier discoveries and will support the existence of Palaeolithic implements on the Cambodian Mekong terraces as described by Saurin (1963a) and Carbonnel (1972). These artefacts look very close to the archaic tools of the Burmese terraces described by Movius (1943, 1948) as well.

Two types of raw material are selected: quartz or quartzite cobbles and silicified wood chunks. Except one piece (Fig. 6, nº 2) that looks like a tested cobble (core?), the other cobble tools are typical choppers with convex or pointed cutting edges (Fig. 6, nº 3, 4, 5).

Tools made of fragments of probable dicotyledonous angiosperm wood are also present with a distal (Fig. 6, nº 6), and a lateral side (Fig. 6, nº 1) retouched. Even if the tools made from this kind of raw material are always more difficult to diagnose than those on cobble, the nature and the position of the retouch allow us to differentiate the artefact from the geofact. Moreover, it should be noticed that the quadrangular and rectangular pieces made of fossil wood have morphologies that have been preferentially selected to be retouched at the expense of other blanks, whatever their raw material, with oval or amorphous shapes. This kit-tool is consistent with the typo-technological group previously described by the mentioned scholars as representing the archaic industries in Southeast Asia.

6. Conclusion

The acknowledged anthropic nature of the cobble tools from the river terraces in the centre of Cambodia should revive field research in Cambodia and Southeast Asia. Pioneering surveys and studies carried out several decades earlier had already highlighted the archeological potential of Southeast Asia (Boriskovsky, 1966; Carbonnel, 1972; Heider, 1960; Movius, 1943; Sarasin, 1933; Saurin, 1963a, b, 1966, 1971; Saurin and Carbonnel, 1964; Van Heekeren, 1948), suggesting that the likely discovery of archaic stone tools, as demonstrated elsewhere in the world (Soriano, 2003; Yi, 2011; see also Pawlik and Ronquillo, 2003), does not necessarily mean ancient.

Southeastern Asian river terraces yield tektites dating to the very beginning of the Middle Pleistocene but do not strictly provide an age to the artefacts. In Cambodia these tools fall within the general parameters of early industries in Asia, and it is now widely recognised that human occupation in Asia took place successively, in different waves (Zeitoun et al., 2010), probably from the beginning of the Quaternary onwards (Wanpo et al., 1995). Indeed, in Pakistan, the site of Riwat were around 2.0/2.5 Ma old (Dennell, 2009; Rendell and Dennell, 1985), in India, stone tools have been dated to 1.5 Ma (Pappu et al., 2011) at Attiramapakkam near Chennai. Longgupo, in southern China is 2.0 Ma old (Boëda and Hou, 2011; Hou and Zhao, 2010; Hou et al., 2000) and/or, at least, sites from the Nihewan Basin in northern China are between 1.6 Ma and 1.3 Ma old (Gao et al., 2005; Huamei et al., 2008; Zhu et al., 2001, 2003) and, finally, the tools from the islands of Java and Flores, the easternmost points of the Southeast Asian archipelago, have been dated to about 0.8 Ma according to tektites occurrence (Simanjuntak et al., 2010; Sondaar et al., 1994; Van den Bergh et al., 1996) but more safely dated by radiometric methods of volcanic formations at Mata Menge (Morwood et al., 1998). Even if not definitely demonstrated everywhere yet, there is a consistent chronological and geographical order that should exhort prehistorians to complement their knowledge of continental Southeast Asian terrains, and particularly in Cambodia. Any such research will involve, first of all, a palaeogeographic and palaeohydrologic study of the rivers and deltas. The fieldwork carried out by the pioneers of the 1930s and the 1960s contributed to drawing up the fundamental bases of cartography and regional geology. Likewise, a morpho-dynamic analysis of the formation of the ancient river terraces, coupled with a petrographic study of the rocks used and the provisioning zones exploited by the first inhabitants of Southeast Asia, must now be undertaken in order to answer questions pertaining to the knapped stone artefacts.

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