

Evolution of the Hoabinhian Techno-Complex of Tam Hang Rock Shelter in Northeastern Laos

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Abstract

Tam Hang rock shelter was excavated in 1934 by the French geologist Jacques Fromaget who discovered 13 skeletons and a lot of stone tools. But after the second World War, the lithic assemblages were lost. Then the site was forgotten since 2003, when the department of archaeology of the Lao Ministry of Culture relocated it and made with a French team a new prospection. In 2007 and after seven campaigns of excavations, a lot of archaeological materials had been found in two new areas opened at Tam Hang South and Tam Hang Central. More than 9000 specimens of stone have been found. This article proposes to give a new approach of the whole stratigraphy with C14 dating. It also makes a characterization of the lithic assemblage which belongs to the Hoabinhian techno-complex.

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Keywords

Hoabinhian, Prehistory, Laos, Lithic Industry

1. Introduction

The Human settlement in Laos has been studied since the late 19th century. Informal surveys conducted in Luang Prabang Province between 1879 and 1895 by the Pavie mission (e.g. Pavie, 1898-1919), and the pioneering excavations in Ban Don Tio cave (e.g. Mansuy, 1920) gave the first data for this archaeological *terra incognita*. Then an archaeological program undertaken by researchers of the Geological Service of Indochina was ambitious and in part successful for Laos (e.g. Colani, 1932, 1935; Fromaget, 1934, 1936, 1937a, 1937b, 1940a, 1940b, 1941, 1952; Saurin, 1935, 1966, 1968; Fromaget & Saurin, 1936; Arambourg & Fromaget, 1938).

After 60 years without excavations, archaeological investigations have increased in the northern part of Laos since the beginning of 2000s (e.g. Sayavongkhamdy et al., 2000; Raymaekers, 2001; Bacon et al., 2008, 2011, 2012; Demeter et al., 2010, 2012; White & Bouasisengpaseuth, 2008; White et al., 2009; Zeitoun et al., 2012). Tam Hang rock shelter in Hua Pan Province was re-located at this occasion.

New archaeological investigations on the site were conducted by some of the authors during seven seasons between 2003 and 2013. They yielded rich cultural and faunal remains which provided new data about stratigraphy and human occupation and the environment (e.g. Demeter et al., 2010, 2012; Bacon et al., 2012). This paper proposes an assessment of stone industry chronology and Hoabinhian techno-complex sequence based on more than 9000 stone implements discovered on the site.

2. Excavation

Tam Hang rock shelter is located in the Annamitic Chain at an altitude of 1120 m in Hua Pan Province (see [Figure 1](#)). It is at the foothill of Pà Hang Mountain, 500 m eastward of Long Nguapha village. In 1934, Fromaget excavated three localities along the rock shelter wall, Tam Hang North (THN), Tam Hang Central (THC) and Tam Hang South (THS) for a total in length of 100 m. In 2003 and then between 2007 and 2013, we extended the investigated surface in opening four new localities laterally behind the historical trench and the back-fill excavation left by Fromaget to check stratigraphy and human occupation extension (see [Figure 2](#)).

2.1. Stratigraphy and Radiocarbon Dating

Because of the archeological campaign of Fromaget in 1934, most of the area in front of the cliff is covered by the remains of at least one year of excavation. These later can reach up to two meters in thickness according to place. They occur at the foot of the cliff on a ribbon of about 100 m length by 15 m width.

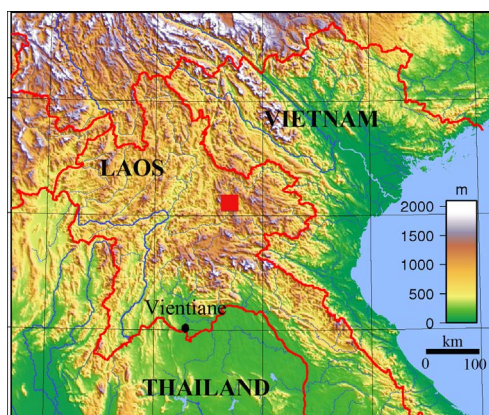


Figure 1. Location of Tam Hang rock shelter.

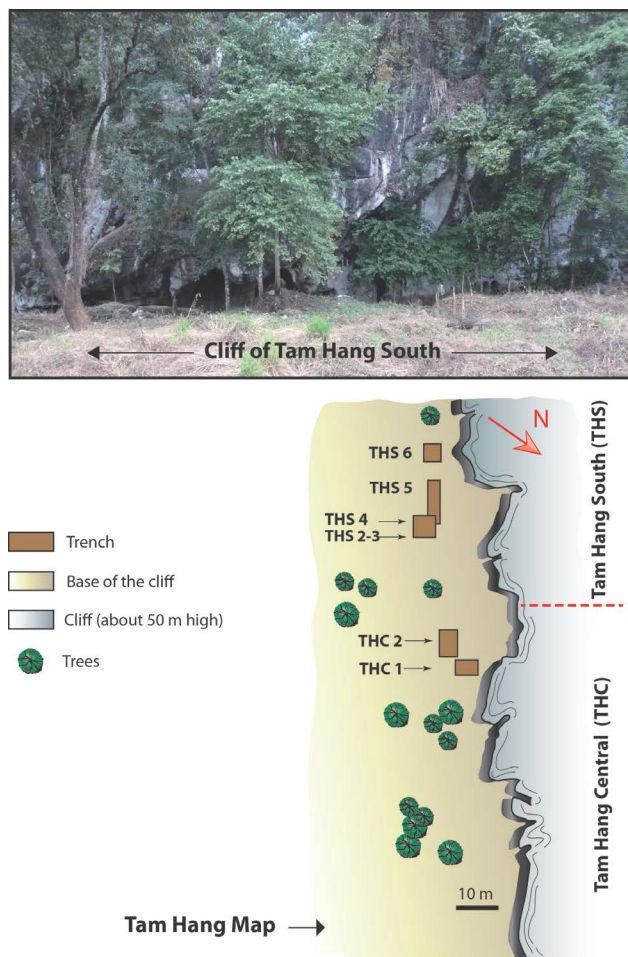


Figure 2. Location of different archaeological squares in Tam Hang South and Tam Hang Central (drawing: Ph. Düringer).

The sedimentary deposit from THS and THC are dominated by argillaceous sediments characterized by collapsed limestone block from the adjacent cliff (Moscovian to Permian limestone). Most of them are generally on size of boulder and block up to several meter length. Smaller clasts exist but are much less important except the anthropic tools. The sediment is wet and soft, mainly brown in color except the topmost part of the section strongly colored in dark due to the presence of the soil. Towards the base, the color is progressively changing to light brown and yellow. The clayey sediment is rich in sand and silt, sometimes enriched place to place by small limestone gravel, iron-oxide pisolite and small laterite clasts.

During 2003s' archaeological campaign, the stratigraphical and sedimentological contexts of THS were well identified (e.g. Demeter et al., 2010). A stratigraphical profile was recognized on ten meters depth with a conglomeratic upper part (until 5 meters depth) then clayish levels in the lower part (from 5 to ten meters). The master bedding displays a strong dip up to 45 degrees. This is the result of successive clast/sediment collapsing during long time from the nearby cliff. This high dip of the layer make that charcoal sampled from different depth can belong to the same layer. For example, samples dated at 13,251 and 11,625, separated vertically by 60 cm come in fact almost from the same layer separated only by 20 cm. Most of the tools are coming from the same level (roughly between 3 and 4 meter from the surface). Levels higher and deeper have not delivered tools.

The section of THC is quite similar. It differs by a high concentration of tool between 1, 5 m and 2, 5 m and by horizontal master bedding. Charcoal samples gave six C14 calibrated dating between 9375 ± 45 BP and 9775 ± 35 BP. Bone and charcoal are scattered in both section from base to top. Thanks to this diachronic sequence, we studied this stone tool industry lithic as a possible evolution of technical skills over 5000 years correlated with the Late Pleistocene/Early Holocene transition (Figure 3 and Table 1).

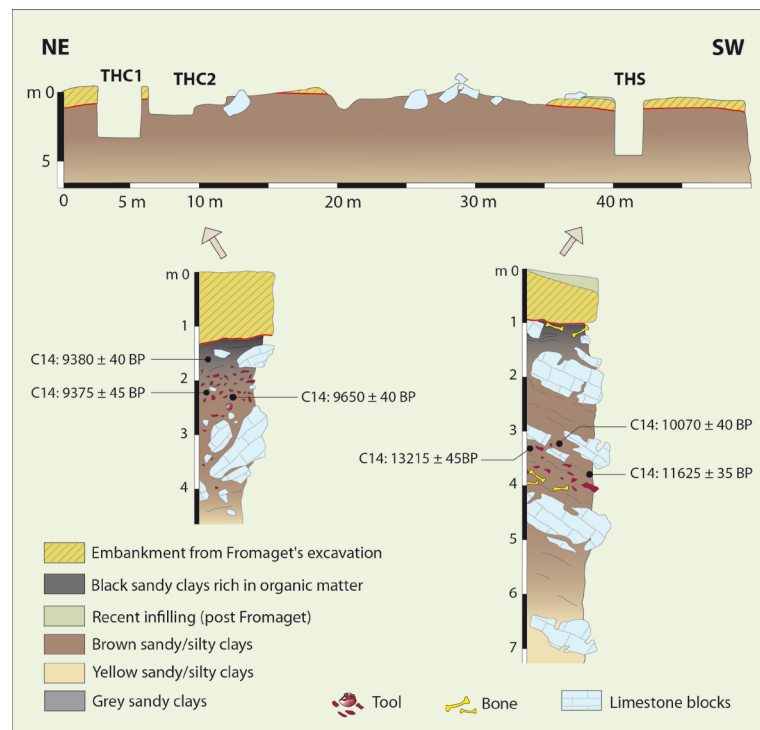


Figure 3. Stratigraphy of the squares excavated with C14 dating (drawing: Ph. Düringer).

Table 1. C14 calibrated dating (BP) of different cultural layers in locus THS4, 5 and THC2. *Radiocarbon Dating Laboratory, Illinois State Geological Survey, University of Illinois at Urbana-Champaign, USA. **Centre de Recherche et de Restauration des musées de France (C2RMF), France.

Area	Depth	Lab. ref.	C14 age (yr BP)
S4	-3.82 m	A1121	11 625 ± 35*
S5	-3.13 m	A1293	10 070 ± 40*
S5	-3.25 m	A1135	13215 ± 45*
C2	-1.62 m	A1292 A1224	9380 ± 40 9775 ± 35*
C2	-2.24 m	SacA 29965 SacA 29966	9375 ± 45** 9505 ± 40
C2	-2.26 m	SacA 29967 SacA 29968	9650 ± 40** 9730 ± 40**

2.2. Method: Stone Artifact Analysis

Lithic assemblages found in THC and THS are relatively homogeneous with tools, flakes, hammers and raw materials. Results are based on techno-functional analysis of all stone artefacts (e.g. Lepot, 1993; Boëda, 1997, 2001; Bourguignon, 1997; Soriano, 2001). In this analysis, the typological approach is associated with a functional framework which can decode the behavioural information encapsulated in products. We have focused on the significance of the attributes of all the products of stone working (flakes, tools, and cores) to therefore reconstruct the processes by which stone tools were made, thanks to diacritical reading of each tool and in joining stone tools (“remontage”). Macroscopic features of converted edges were also identified.

3. Results for Tam Hang South

The re-investigations initiated in 2003 were conducted in the southern area in locus 2, 3, 4, 5 and 6. Excavations

delivered more than 900 knapped stones mainly located in locus 4 and 5 in levels dated between $10,070 \pm 40$ BP and $13,215 \pm 45$ BP.

The corpus analysis throughout the stratigraphy shows a change in the assemblage composition (see **Table 2**). In the upper-levels, cores and flaked tools are more abundant than in lower levels, and core tools that characterize deeper levels are less abundant. It's the same with the increase of raw materials and flakes (74% to 90%) that can be explained by the evolution of the flaking process which will be discussed later.

Tool Types

Core tools and flaked tools coexist in the same layers. Flaked tools have either re-sharpened edges or were used directly. This sample represents over 9% of the whole corpus.

Three types of core tools were recovered throughout the sequence: sumatralith, massive scraper-like tools and blocks which include a variety of worked pebbles or cobbles with a cortical preserved surface. Whatever the type of core tool, the size of raw material (pebbles or cobbles) is quite similar.

Sumatralith are cobbles flaked on one side (**Figure 4**). Two to three generations of flake removals are initiated from the opposite cortical surface. They produce a specific tool shape (sub-triangular, flounder, oval, circular or oblong associated to two kinds of cross-sections: plano-convex or biconvex) with a peripheral edge of which some portions are used. Each tool has at least three active parts with angles ranging from 40° to 85° with an average between 60° and 70° .

The assemblage also has half-sumatralith which belongs to the short-axe type defined by Colani (e.g. Colani, 1929b; Matthews, 1966). We noticed that all the short-axes of this assemblage got from sumatralithes. Once the manufacture tool is completed, the stone artefact is struck. A transverse fracture is visible at one end of the sumatralith. This technical process may have been used to get a specific size and shape. The half-sumatralith has the same shape and volume as the other unfractured specimens (**Figure 5**). Whole specimens probably would have been too bulky or heavy for Prehistoric men.

Massive scrapers of the assemblage are made from quadrangular pebbles or a cobble fragment of which a straight or convex natural edge is sharpened (**Figure 6**). They have the same size and weight as the sumatralithes. The flaking strategy also seems similar. The knapper sharpened the forehead formed by the intersection of the cortical surface and the flaked surface.

Backed scraper-planes were also identified in various areas. They look like scrapers but the sharpened edge presents large flat removals.

The bifacial specimens are particularly scarce. Two shaped tools show bipolar and incomplete removals opening opposite sharp-cutting edges.

4% of the tools corpus are flakes. This category includes flakes with macro-use wears and retouched edges. Eight different types have been identified: scraper, notch, denticulate, end-scraper, burin, drill, scraper and denticulate, scraper-notch and used flakes.

Blank selection appears to be based on size (see **Table 3**). Tools are systematically longer and thicker than debris. Their size also changes over time. In the deeper levels, they are bigger and thicker than the upper levels. Their selection takes place at the beginning of the operating process.

Table 2. Assemblages composition in the different layers.

Type	Upper level (undated)		Before 10,000 ¹⁴ C yr		Between 10,000 and 11,500 ¹⁴ C yr		After 11,500 ¹⁴ C yr	
	Number	%	Number	%	Number	%	Number	%
Raw material	37	21.1	177	56.6	67	39.9	127	47.2
Flakes	93	52.9	117	37.4	70	41.7	128	47.6
Core tool	3	1.7	18	5.7	21	12.5	8	3
Flaked tool	23	13	0	0	10	5.9	4	1.5
Core	18	10.2	1	0.3	0	0	0	0
Hammerstone	2	1.1	0	0	0	0	0	0
Undetermined	0	0	0	0	0	0	2	0.7
Total	176	100	313	100	168	100	269	100

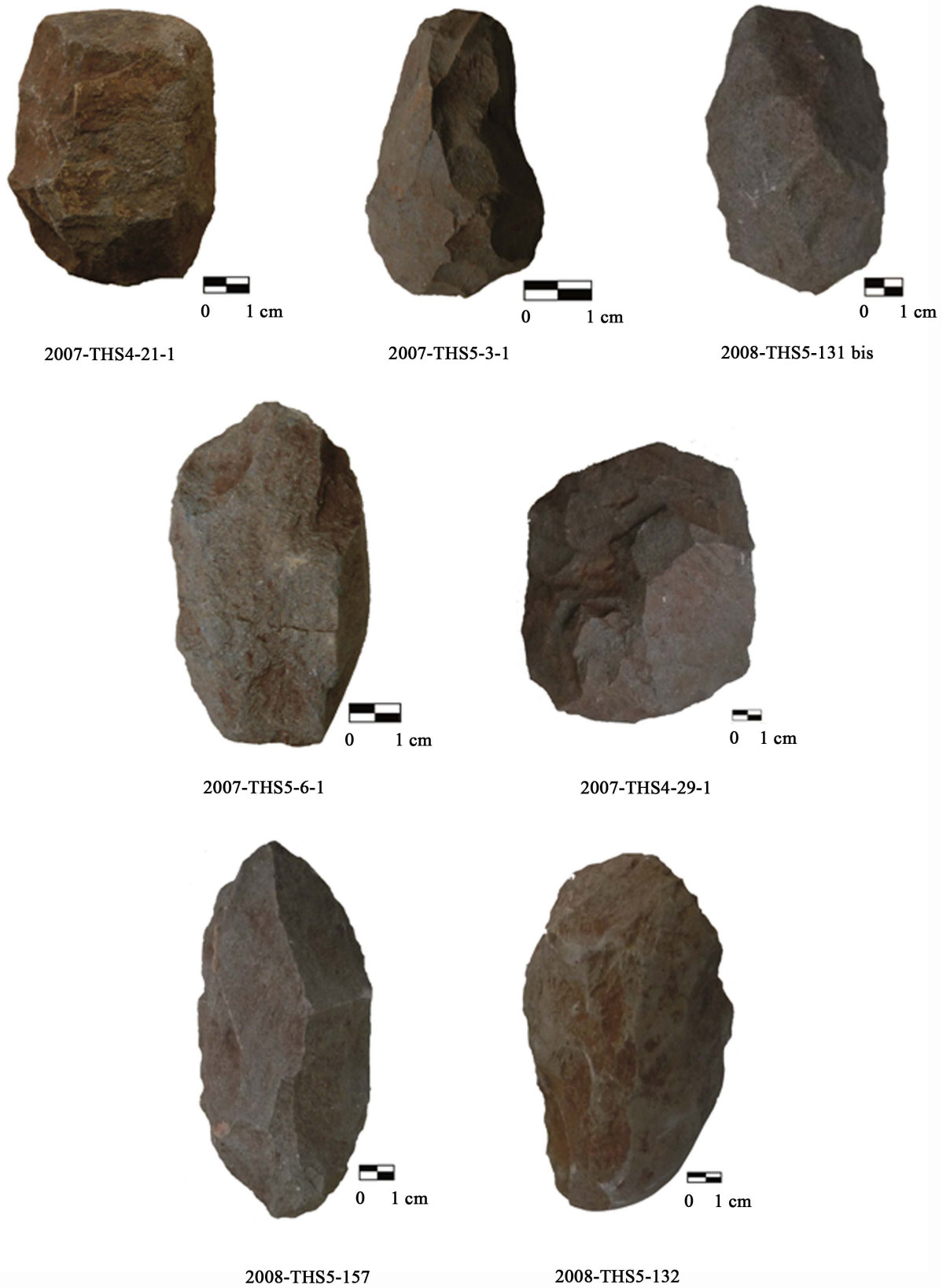
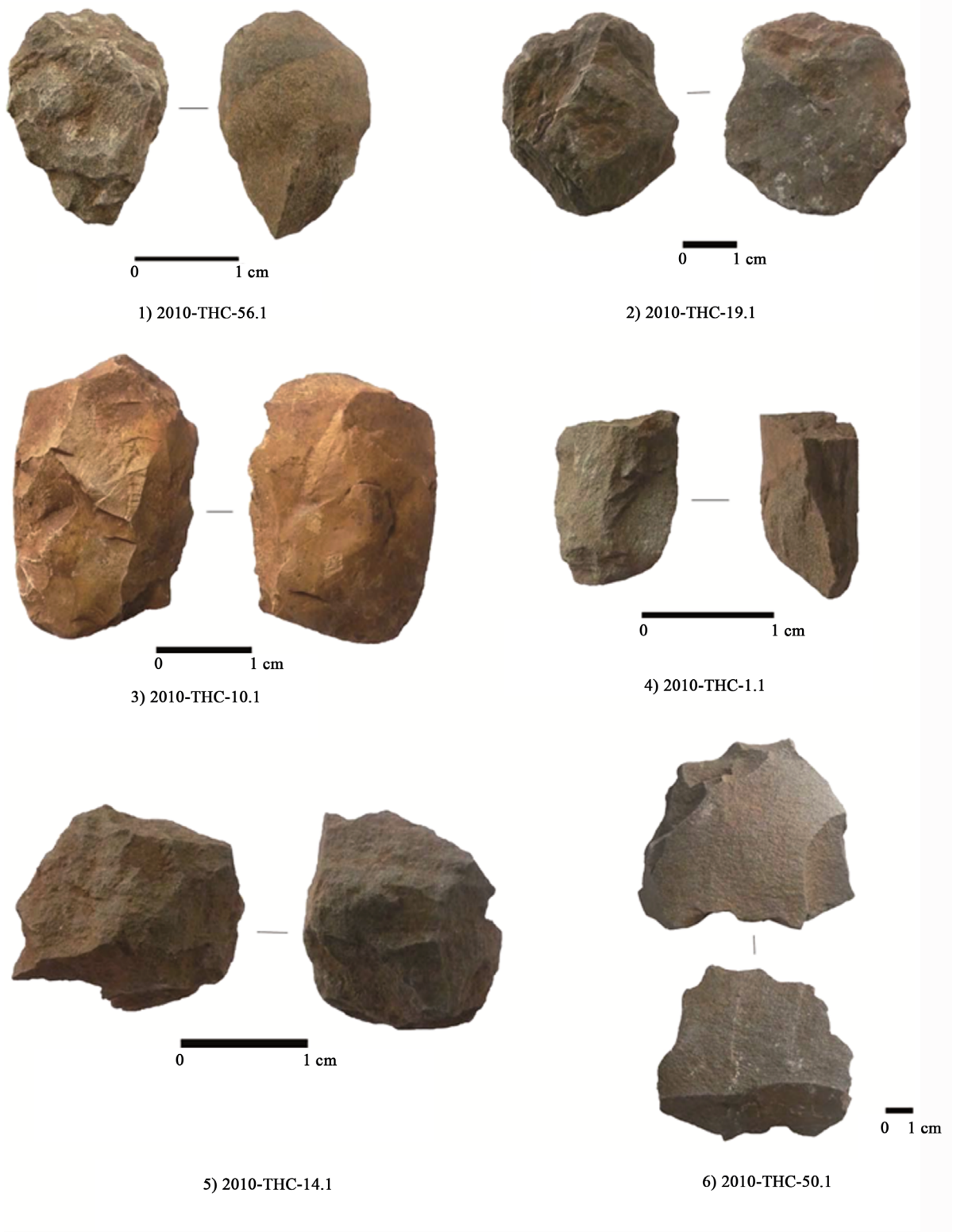


Figure 4. Sumatralithes (photo: E. Patole-Edoumba).



1, 2, 3: Sumatralithes; 4, 5, 6: Half-sumatralithes

Figure 5. Sumatralithes (1, 2, 3) and half-sumatralithes (4, 5, 6) (photo: E. Patole-Edoumba).

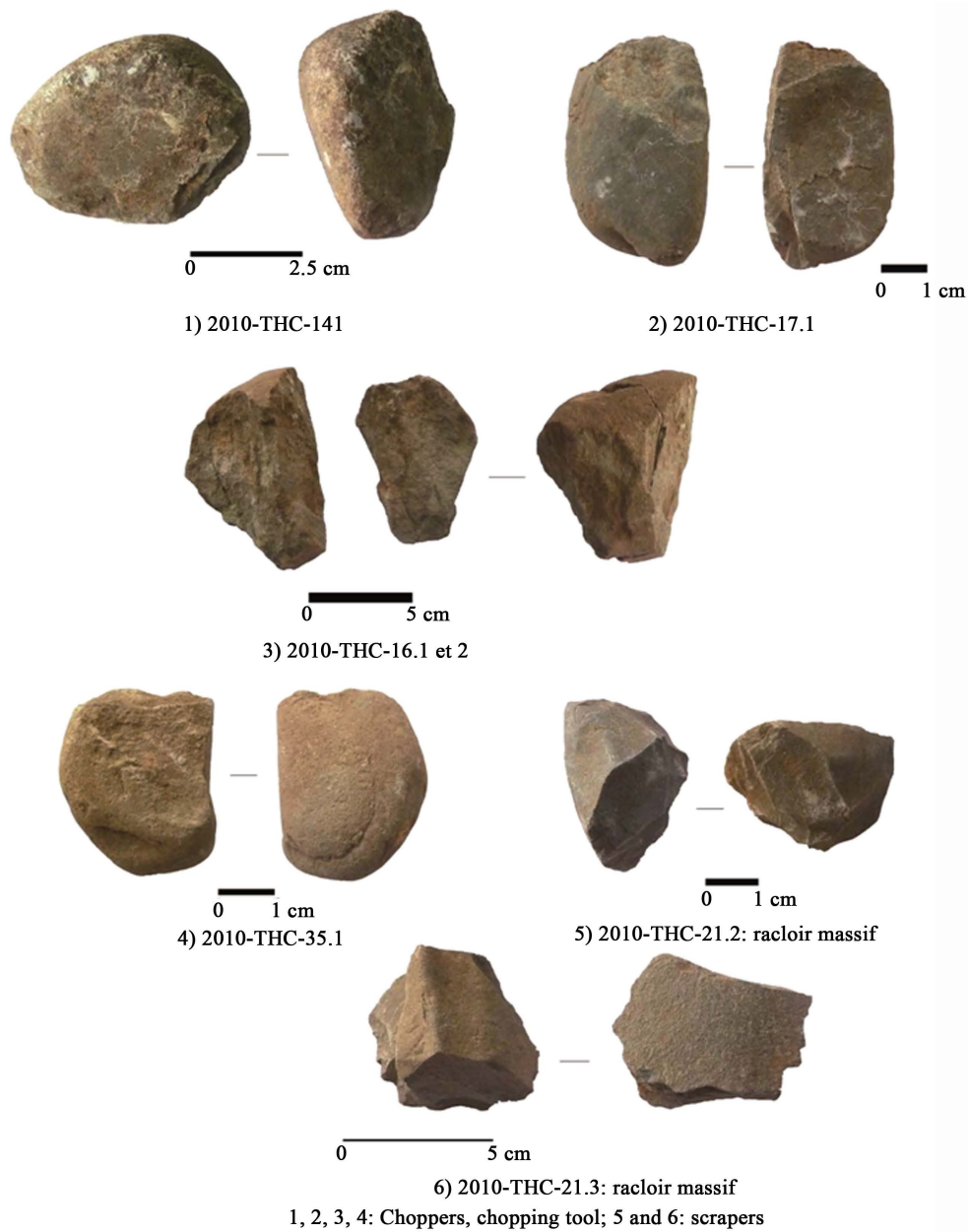


Figure 6. Choppers, chopping tools (1 to 4) and scrapers (5 and 6) (photo: E. Patole-Edoumba).

Table 3. Average size of flakes and tools of different levels.

	Flakes	Tools
Length (cm)	3.5	5.3
<i>Deviation</i>	2.7	1.7
Width (cm)	3.2	4.8
<i>Deviation</i>	1.4	1.5
Thickness (cm)	0.7	1.6
<i>Deviation</i>	0.4	0.5

4. Results of Central Area

In the THC area, lithic assemblage belongs to a layer dated between 9300 and 9700 BP (see [Table 1](#)). More than 8000 artifacts were identified such as hammer and anvil, raw materials, choppers, sumatraliths, debris, retouched and used flakes. All these implements were connected with fragments of animal bones, sometimes burnt, assigned to *Macaca cf. fascicularis*, *Arctonyx collaris cf. rostratus*, *Sus scrofa*, *Sus cf. scrofa*, *Bos frontalis*, *Bos cf. frontalis*, *Bos sauveli*, *Bos cf. sauveli*, *Bos javanicus*, *Bos cf. javanicus*, *cf. Bubalus bubalis*, *Cervinae indet.*, *Axis porcinus*, *Cervus cf. unicolor*, Rhinocerotidae indet., *Rhinoceros cf. Unicornis*.

Tool-types

Typology of tools is quite similar to those presented in Tam Hang South area with core-tools and retouched and used flakes produced during the reduction sequence.

In this area, the assemblage contains only 3.4% of core-tools. Six different types have been identified: sumatraliths, half-sumatraliths (36%) and massive scrapers (34.3%). The presence of half-sumatraliths is specific to this assemblage. During the flaking process, some pebbles are left when an edge is not convex enough to be sharpened in sharp-cutting (21.2%). Some pebble fragments are also used without modification because a natural sharp-cutting exists (0.9%). Three hemi-pebbles have been identified in this assemblage. This specific tool was identified in Thailand ([Forestier et al., 2005](#)). Their flaking involves a reduction sequence and a debitage method we will discuss later.

The size of all these tools is quite similar, between 9.2 and 8.6 cm long, 7.2 and 7.5 cm wide and 3.8 and 4.2 cm thick. During the reduction sequence, the initial volume of the raw material is reduced by at least 46% which explains the 73.6 % of flakes of the assemblage. The strategy is more to decrease the pebble length (with a loss of 29.7%) and thickness (17.6% on average) than to decrease the width (6.6%).

One of the core-tool features is the production of one to three active or passive techno-functional units used for cutting, chopping or drilling on active way or for fitting or gripping.

Their size and angle are quite similar on these two types of tools with 5 cm in length and angles between 45° and 85°.

Tools on flakes represent 1% of the assemblage. Six tool-types have been identified: notches, denticulated, scrapers, scraper with notch or scraper with denticulated, drill, used blanks (see [Figure 7](#)). Tools are longer, wider and thicker than debris (see [Table 4](#)). It was also performed in most cases during the first stages of the knapping process.

5. Discussion: Knapping Techniques Changing over Time

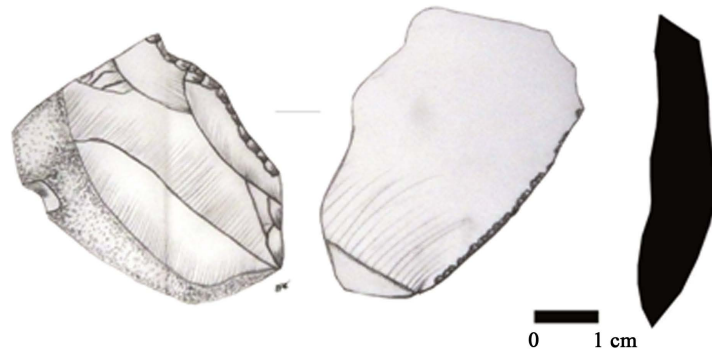
The typological analysis shows that stone tools have changed over time. Core tools dated from 11,500 BP are longer than the previous ones: length/width ratio is higher than before (1.6 compared to 1.1 and 1.2). Since 11,500 to 9300 BP the sumatralith size decreases in relation to their weight (450 g to 120 g) (see [Table 5](#)). This variability depends on the raw material selection process. Choppers were first favoured in the lower levels. They were much bigger around 13,000 BP then thinner around 9300 BP. During the Holocene, this kind of tool was substituted by tools on flakes whose size decreased throughout time. And there is less tool diversity in the undated upper level with four tool-types including burins, drills and end-scrapers previously missing.

The technical approach based on the identification of the knapping process gives us some explanation. We can also suggest that the climatic change between the Late Pleistocene and Early Holocene has been an impact on hunter-gatherer technical behavior.

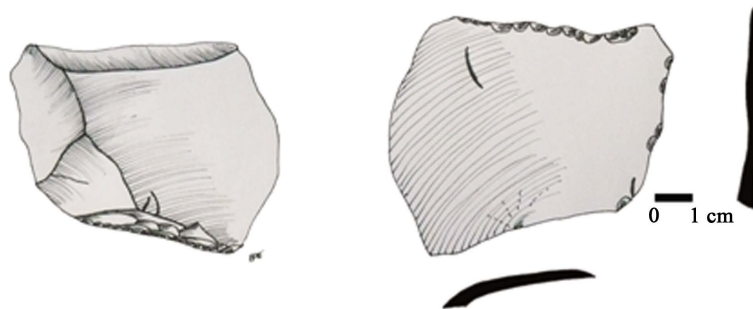
5.1. Raw Material Selection

In 1934, Jacques Fromaget identified quartzites and schists. 99% of the new assemblage is quartz sandstone and quartzite. Nevertheless, rhyolites, trachytes, jasper type and some diorite were also used by Prehistorics. Different kinds of quartzite, well-cemented or not were present on the site. 20% of raw material picked up, was not useful because of its very bad quality. However, knappers focused on raw materials with the highest knapping-potential. Tools were made in fine quartzite and siliceous sedimentary and volcanic rocks which insure a good percussion wave.

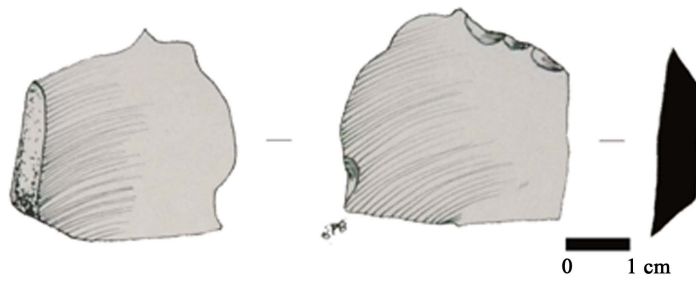
Raw material origin is mainly local. The stream flowing at the bottom of the rock shelter may have been used to get pebbles as well as fragments of quartzite, and basalt. Milky quartz veins in the granitic series, which forms the bedrock of limestone and arkosic sedimentary series are common in the area and may have been a second choice. Raw materials have been stored on the site. Many fragments, sometimes with cortex, were found



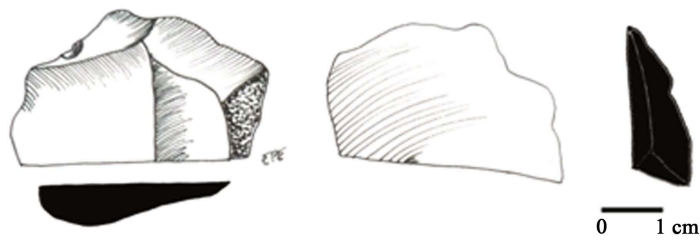
2009-THC-153 scraper



2009-THC-44-1 transverse scraper



2009-THC-2 notch



2009-THC-83 notch

Figure 7. Retouched flakes from Tham Hang Central (drawing: E. Patole-Edoumba).

Table 4. Comparison of the average size of flakes (tools and debris).

	Debris size (cm)	Tools on flakes (cm)
Length	4.1	5.2
<i>Deviation</i>	2.1	1.8
Width	3.8	4.7
<i>Deviation</i>	1.5	1.6
Thickness	1.1	1.6
<i>Deviation</i>	0.5	0.7

Table 5. Evolution of sumatralith in different layers.

	Circa 9300 ¹⁴ C yr	Between 10,000 and 11,500 ¹⁴ C yr	After 11,500 ¹⁴ C yr
Length (cm)	9	9.5	11.4
<i>Deviation</i>	2.8	1.5	0.6
Width (cm)	7.3	7.6	7
<i>Deviation</i>	1.4	2.3	0.4
Thickness (cm)	3.2	3.8	4
<i>Deviation</i>	0.5	0.6	0

in different levels. In addition, we have conjoined flakes and cores until the original raw material was obtained. So we think the whole knapping process was realized in situ.

5.2. Direct Percussion on an Anvil

A slab of stone connected with a small hammerstone in Tam Hang Central, scars recognized on both ends of tools and wasted flakes allow us to think that a direct percussion with anvil and hammerstone was used. The core was rested on the anvil and braced by one hand while the other hand struck it with the hammerstone. Such a technique is well-known and useful for flaking spherical pebbles or without cortical dihedral, as well as rectangular cobbles (like the raw material available on the site). But the traditional technique of freehand direct hard-hammer percussion was also used at the end of the core reduction process.

5.3. Functional Hypotheses

The issue of tool uses in Palaeolithic Southeast Asia has been discussed for several years. Initial assumptions were made in the 1970's. Woodworking and bamboo butcher or activity has been proposed (e.g. Solheim, 1970; Hutterer, 1976, 1977; Sørensen, 1982; Reed, 1997; White & Gorman, 2004). Usewears analysis has since confirmed these suggestions (e.g. Pookajorn, 1996; Higham & Thosarat, 2004). It is also admitted that stone use was not exclusive in a tropical environment and as with current groups; prehistoric societies may have developed a kinetic technology based on wooden and bamboo material (e.g. Gourou, 1948; Dennell, 2009; Schick & Zhuan, 1993; Solheim, 1970).

At Tam Hang rock shelter as at other Hoabinhian sites excavated in Vietnam and Thailand, invertebrates and vegetal remains are missing in archaeological layers (e.g. Gorman, 1971; Viet, 2004). However, on this site both sectors have delivered many burnt bone fragments of mammals (terrestrial and arboreal living in forested areas or in the surrounding plains) directly in association with lithic implements, suggesting a butchering activity on this place.

Furthermore, fauna currently hunted in these areas with throwing weapons (spears, arrows or darts) let us think that massive and heavy tools fitted on shafts would not have been efficient for this kind of activity. On the other hand, wood and bamboo scraping or cutting with different stone tools have been tested. And choppers, scrapers, sumatralithes and flakes seem suitable for transforming organic raw material (e.g. West & Louys, 2007; Yosef et al., 2012, Pawlik, 2015). Both, arguments for a predation activity of forest mammals and an exploitation of vegetation in Tam Hang is likely, especially if we take into consideration the climatic change of the Pleistocene/Holocene transition. Paleoclimatic studies in the Peninsula (e.g. Penny, 2001; Maxwell, 2001; Penny, 2006; Maxwell, 2004; Marwick & Gagan, 2011; Cook & Jones, 2012) show the appearance of the monsoon phenomena

and the expansion of tropical forest during this period. It may explain the adaptive strategy of hunter-gatherers in sharpening smaller flaked tools at Tam Hang.

5.4. Different Technical Systems in Upper and Lower Levels

In undated upper levels in Tam Hang South, two different technical systems were identified: core reduction and debitage. Freehand direct hard-hammer percussion was used for debitage. Hammerstones found in layers are rounded waterworn sandstone pebbles of 80 to 120 g in weight. The core study recognized the same operating sequence based on the surface exploitation of the core. This method belongs to the algorithmic type system of alternating debitage surface (SSDA) during which, each sequence the previous debitage surface is used as a striking platform for new removals (e.g. Patole-Edoumba, 2012). The operating sequence is short with one to six removals. Most of the time, from one striking platform, blanks are flaked on one or two debitage surfaces. Hence sometimes bipolar flaking is realized on a same surface.

A core reduction method was also identified on a scraper-like core, a chopper and a sumatralith with partial removals on both sides. Such a tool is a variant of sumatralith-type. Both removals on the usually cortical surface are used to create a flat surface needed to develop a sharp edge.

The systematic technical study of core-tools found in lower levels highlights the predominance of a unifacial core reduction method from elongated flat pebble or rectangular pebble. The knapper skill is to use natural convexity of raw material block either to generate sharp edge and get massive scrapers or to develop a plano-convex volume (flat surface still remaining cortical) and releasing a potential active edge all around the tool. In this latter case, the flat or bi-plane cortical surface is predetermining for the development of the pre-determined convex surface. The butt flakes in “bird wings” shape point to the exploitation of natural convexities.

In the first case, the operating system is quite short (two to three generations of removals on one edge). In the second, we see various stages from shelling to sharpening. Sometimes as a result of this process, sumatralith is half-broken in thickness to reduce its size. This operating sequence generates many flakes (70% of the whole assemblage), a single tool can require up to 30 removals. So, for 222 core-tools, over 4000 flakes were discarded. Bifacial tools from the assemblage result from the same process (see Figure 8).

This option is considered when the edge created by the natural surface and the flaked surface is not suitable or sharp enough. Prehistoric man changes it by removals on the cortical surface. Sometimes, the plano-convex volume expected is not achieved despite the convexities depletion. In this condition, it's a bifacial tool with a triangular or trapezoidal cross-section which is sharpened.

Also, we suggest that some tools are stages in a same operating sequence whose purpose is to get a suitable edge (convex or straight closed to the average of 70° - 75° with a somewhat concave cutting). The first stage is to generate a single edge (chopper, massive scraper, notched or serrated) which can become half-peripheral or on the entire circumference such as sumatralith (artefact with the most successful volume) that allows it to generate several edges. We even suggest the sumatralith is the culmination of a chopper-chopping tool in so far as it proposes an optimization of the potential of a sharp edge peripheral. In this scheme, the bifacial tool appears to be a result of the knapper inability to shape the specific volume of sumatralith.

A system variant has been identified on three artifacts that are hemi-pebbles. Their production involves a process scheme with debitage then core reduction. Raw material is flaked in two parts lengthways using a bipolar flaking on an anvil. Edges of each hemi-pebble are then sharpened with removals and retouches (see Figure 9). These removals are on the flaking surface preserving the cortical surface. During this process, the knapper makes a selection of flakes from the first or second generation of removals to convert them into tools.

6. Conclusion

Tam Hang assemblage belongs to the regional Hoabinhian facies discovered during the 1920's and 1930's by Madeleine Colani in Vietnam and reassessed several times since this period (e.g. Colani, 1929a, 1929b; Saurin, 1951; Heekeren, 1961; Matthews, 1966; Boriskovsky, 1969; Hayden, 1977; Schoocongdej, 1996; Hoang, 1989; Pookajorn, 1990; Bellwood 1997; Forestier 2005; Yi et al., 2008, Marwick, 2008, 2013, Forestier et al., 2010). Different meanings were given to Hoabinhian such as a culture, an industry, a chronological sequence, a tradition or a techno-complex since its first characterisation at the Préhistoric Congress of Far East in 1932 (Moser, 2001, 2012).

We retain the concept of a techno-complex based on: i) a lithic assemblage including tool types of Sumatralith, short-axe, disc and “the amorphous tool types” such as scraper, chopper, flakes (Gorman, 1972; Pookajorn, 1990;

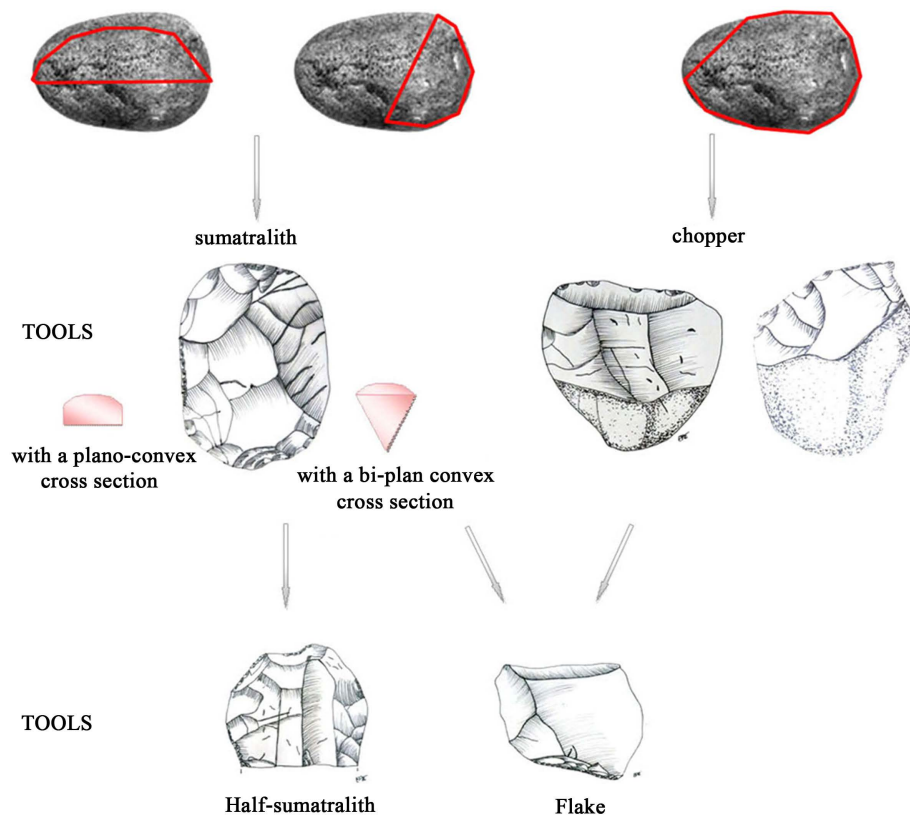


Figure 8. Core reduction process (drawing: E. Patole-Edoumba).

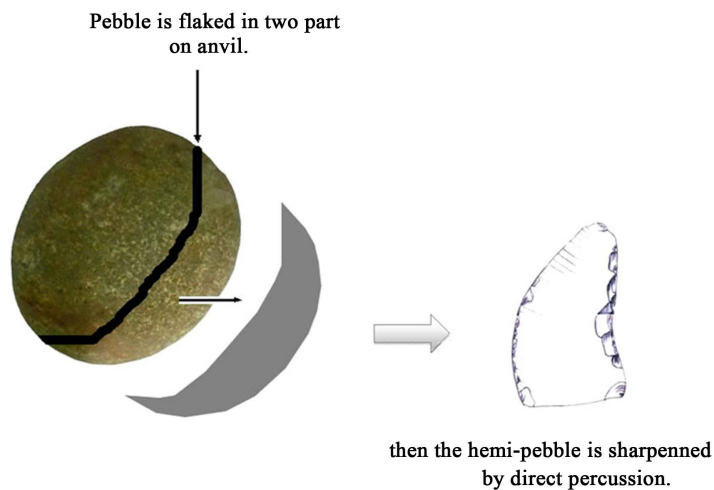


Figure 9. Operating process with debitage and core reduction (photo and drawing: E. Patole-Edoumba).

White & Gorman, 2004); ii) three specific operation sequences concerning cobble tools (Zeitoun et al., 2008; Patole-Edoumba, 2012; Forestier et al., 2013; Forestier et al., 2015); iii) a specific paleoenvironment context (Gorman, 1972).

Identified in more than 150 sites in Southeast Asia, this facies, appearing during just before the Last Glacial Maximum (LGM) circa 30,000 years BP in Vietnam, Thailand and Burma (e.g. Aung, 1969; Sørensen, 1982; Santoni et al., 1990; Binh, 1991; Bowdler, 2008; Yi, et al. 2008; Marwick, 2008, 2013), had extended to India and Australia and might be the Philippines (e.g. Solheim, 1974; Sharma, 1988; Moser, 2001, Hazarika, 2012, 2013;

Gaillard et al., 2011, Soni et al., 2014), and it continued until 10,000 years BP and 3000 years BP particularly in Malaysia (e.g. Dunn, 1964; Matthews, 1966; Gorman, 1971; Glover, 1977; Bellwood, 1993, 1997; White & Gorman, 2004; Forestier et al., 2013; Higham, 2014). Dating and cultural implements in Tam Hang correspond to second stage or classical Hoabinhian (18,000-10,000 years BP) defined by Madeleine Colani for Vietnamese sites. Therefore, the rock shelter is one of the first cultural markers for Laos as sites in Khan and Pa Valleys in Luang Prabang and Ngeubhinh Mouxou (e.g. White et al., 2008; 2009; Zeitoun et al., 2012). But, the profusion of lithic implements and the depth of stratigraphy allow us to characterize the assemblage with specific tools and three kinds of knapping processes. We have also demonstrated a stone-tool evolution during the Late Pleistocene-Early Holocene transition is linked with ecological and environmental changes. The classical Hoabinhian techno-complex of Tam Hang with some particularity such as half-sumatralith and hemi-pebbles also identified on Thaï, Cambodian archaeological sites and the Chuandong site in Guizhou Province in China (e.g. Forestier, 2005) indicates the geographical location of the site at the crossroad between Vietnam, Thailand and southern China.

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