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Discovery of a prehistoric site at Sao Din (Nanoi, Nan province, Northern Thailand): Stone tools and new geological insights

Découverte d'un site préhistorique à Sao Din (Nanoi, province de Nan, Nord de la Thaïlande) : études lithique et géologique préliminaires

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ABSTRACT

While a series of new discoveries in India or China seem to demonstrate a much older human presence during the Early Pleistocene, information concerning the demographic expansion of human groups into continental Southeast Asia is generally lacking – although osteological evidence does exist for an early human presence in Indonesia. Recent excavations in northern Thailand have produced a series of stone tools which present an ideal opportunity for reconsidering the archaeological record of the Early Pleistocene in this region. Here we provide a preliminary description of the geomorphological context and an initial technological analysis of the stone tools from the Early Pleistocene site of Sao Din in northern Thailand. Technologically, the lithic assemblage presents the most similarities with southern Chinese assemblages dated to between 1 Ma and 0.5 Ma.

RÉSUMÉ

Selon les découvertes et les études récentes de matériel, les données semblent montrer une présence plus ancienne de la diffusion humaine pour le Pléistocène ancien en Inde ou en Chine, mais ce peuplement humain présente toujours des défauts d'information pour l'Asie du Sud-Est, alors que des preuves ostéologiques de présence humaine anciennes existent en Indonésie. La découverte d'une série d'outils lithiques dans le Nord de la Thaïlande est l'opportunité d'améliorer ce manque de données. Nous présentons la première description

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du contexte géomorphologique et l'analyse technologique initiale des outils du site préhistorique de Sao Din. Du point de vue technologique, l'assemblage lithique de la localité de Sao Din est plus proche de ceux connus dans le Sud de la Chine qui sont datés entre 500 000 et un million d'années.

1. Introduction

New lithic evidence seems to demonstrate an Early Pleistocene human presence in India (Dennell, 2009; Pappu et al., 2011) and China (Hou and Zhao, 2010); however, the timing and geography of human expansion events for the same period in continental Southeast Asia are still poorly understood. First identified in 1987 by Sayan Prisanchit, the site of Sao Din was not properly investigated until 2006 as part of fieldwork conducted in northern Thailand by the Thai-French Paleosurvey. The lithic assemblage recovered during surveys and excavations is comparable with recently described Palaeolithic stone tool industries from eastern Asia (i.e. India, China, Korea) but quite different from those known from other Southeast Asian countries such as Java and southern Sumatra (Simanjuntak and Forestier, 2008; Simanjuntak et al., 2010). Although this material has yet to be reliably dated, the very presence of this type of assemblage nonetheless provides valuable information concerning the region's complicated Pleistocene archaeological record. Here we present the site's geomorphological context and some elements concerning the technology and general morphologies of the stone tools recovered from the site of Sao Din.

From a regional perspective, one of the main interests of this material lies in the fact that it was recovered beyond the eastern limits of the Movius Line (Movius, 1948), often considered to divide eastern and western Palaeolithic technological traditions. This theory is still widely accepted even though shortly after Bordes (1968) first brought it to a more global audience, bifaces were described by Saurin (1971) from Xuan Lôc, Vietnam. This theoretical line has since been criticized for presuming that the absence of evidence for bifacial stone tools is evidence of absence (Boriskovsky, 1971) and for ignoring finds in East Asia (Hutterer, 1977) such those from the site of Nui Do (Thanh Hoa province, Vietnam) (Huy Thong, 1976; Van Ta, 1980). Furthermore, bifacial technology has since been identified from the Bose Basin in the Guangxi province of China, as well as in the middle and western parts of the country (Derevianko, 2008; Hou et al., 2000). Although the Movius Line remains the subject of considerable debate (Chauhan, 2011; Keates, 2002; Norton and Bae, 2008), it is important to distinguish between the current state of research in Asia and questions issuing from an outdated theoretical position or those tied to a particular Western conception of the archaeological record (see, for example, Otte, 2010).

2. Stone tools recovered from Sao Din

One hundred and thirty-nine objects were collected from ravine floors or in proximity to natural pinnacles at the Sao Din locality which is found within the National Geological Park of Si Nan (N 18° 17′ 46″ E 100° 45′ 24″) (Fig. 1). Genuine stone tools were distinguished from potential geofacts based on technological criteria. Similar to many

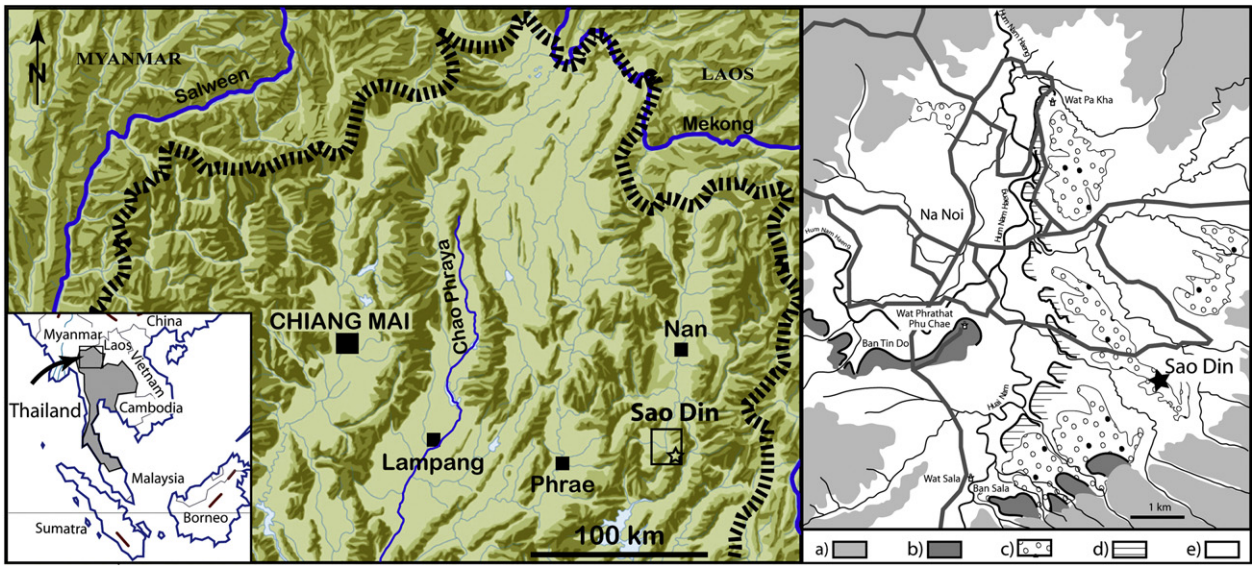

Fig. 1. Location of Sao Din: a: Ante-Tertiary substratum of the Nanoi Basin; b: Upper terrace; c: Plio-Quarternary fluvio-lacustrine deposits; d: Lower terrace; e: Holocene deposits and superficial formations.
Fig. 1. Situation géographique de la localité Sao Din : a : substrat anté-tertiaire du bassin de Nanoi ; b : terrasse quaternaire supérieure ; c : dépôts fluviolactures plio-quarternaires ; d : terrasse quaternaire inférieure ; e : dépôts holocènes et formations superficielles.

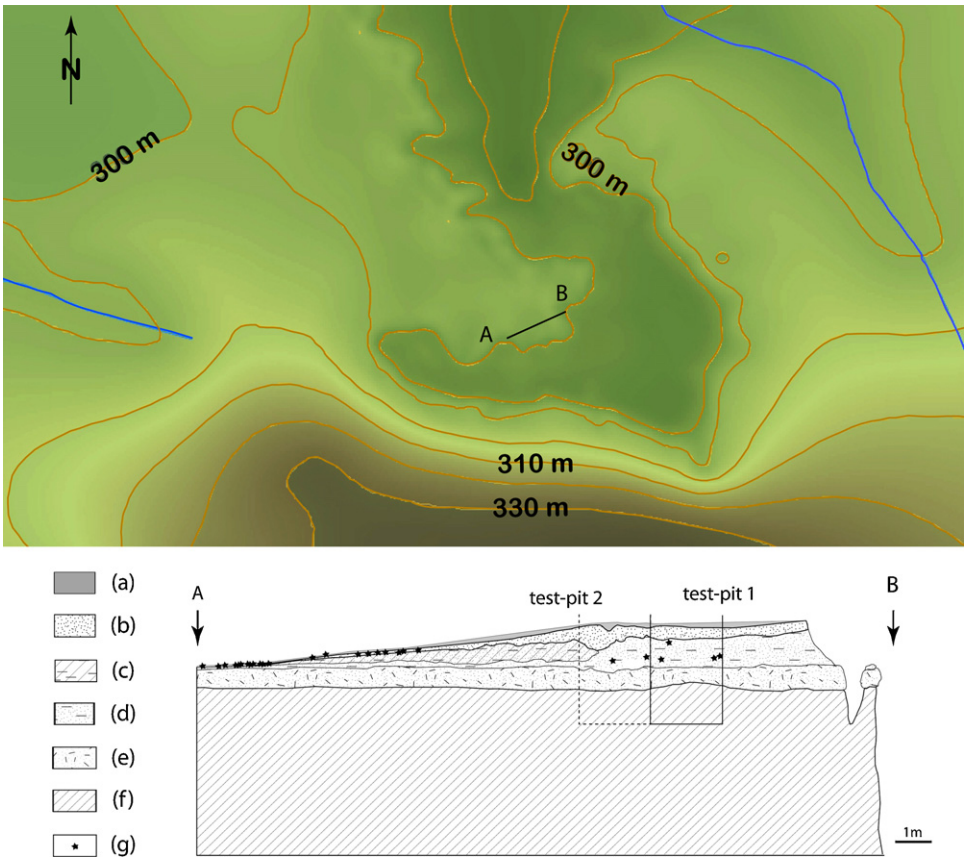

Fig. 2. Map and profile of the excavation: a: organic horizon; b: alluvial horizon with sandy loam, non-cemented matrix with heavily altered gravels; c: colluvio-alluvial horizon with sandy clay loam, non-cemented matrix; d: sandy clay, heavily altered pebbles, numerous angular to smooth flaked gravels (altered to slightly altered), few blocks, altered gravels, few cobbles; e: sandy clay with few cobbles; f: silt and clay; g: stone tools.
Fig. 2. Carte et coupe de la fouille : a : horizon organique ; b : horizon alluvial avec sédiments sableux à matrice non cimentée avec graviers très altérés ; c : horizon colluvio-alluvial avec sédiments sablo-argileux à matrice non cimentée ; d : argile sableuse contenant des galets très altérés et de nombreux fragments de galets anguleux à arrondis (altérés à peu altérés), quelques blocs et plusieurs galets altérés ; e : argile sableuse avec quelques galets ; f : silt et argile ; g : outils lithiques.

Indian or Chinese (as well as African) open-air sites, this material was collected without any precise stratigraphic context prompting us to excavate several test-pits within the uppermost geological layer, about 20 m above the surface where the stone tools were initially collected, in order to identify their original stratigraphic position. Six artefacts and one piece of silicified wood were discovered from soil depths ranging from 20 to 110 cm. The thoroughly investigated area around the test-pits also yielded 24 pieces collected up to 5 cm below the soil layer (Fig. 2). The artefacts are predominantly manufactured in a light brown sandstone and occasionally quartzite. The stone tools recovered from the site include choppers, chopping-tools, denticulates, scrapers, pieces with steep front edges (*rabot*), occasional convergent unifacial tools (convergent edge or point with an 'amygdaloid' morphology), unifaces with transverse edges and thick retouched flakes, often larger than 10 cm (Fig. 3). Much like the case for Chinese or Korean sites (Otte, 2010), only two bifacial pieces were recovered from the test-pits. The heavy-duty tools from Sao Din can be divided into two major groups: chopping-tools and choppers. The chopper group includes very basic unifacial tools, with or without multiple sharp edges, having intentionally unmodified surfaces or bearing 'discoidal' removals. The sharp edges, or Techno-Functional Units (TFU) (Boëda, 1997; Brenet, 1996; Lepot, 1993), created on these cobbles can be categorized as rectilinear, convex or concave with simple retouch or alternate denticulated edges created by a series of notches.

3. Physiography and geology of the site

Found in Nan province, the site of Sao Din is located in the southern part of the Na Noi Basin, one of northern Thailand's middle intermountain basins to the east of the Lampang and Phrae Basins. Between latitudes N 18° 15′ and 18° 22′ and longitudes E 100° 41′ and 100° 46′, the Na Noi Basin covers approximately 30 km^2 and is 4–5 km wide from north to south and 7–8 km long from west to east. Cartographic information provided by the Geological Survey Division of the Department of Mineral Resources (Hess and Koch, 1975; Meesuk and Shoosuwan, 1980) indicates that the eastern and western sides of the Na Noi Basin and the surrounding area to be characterized by Triassic

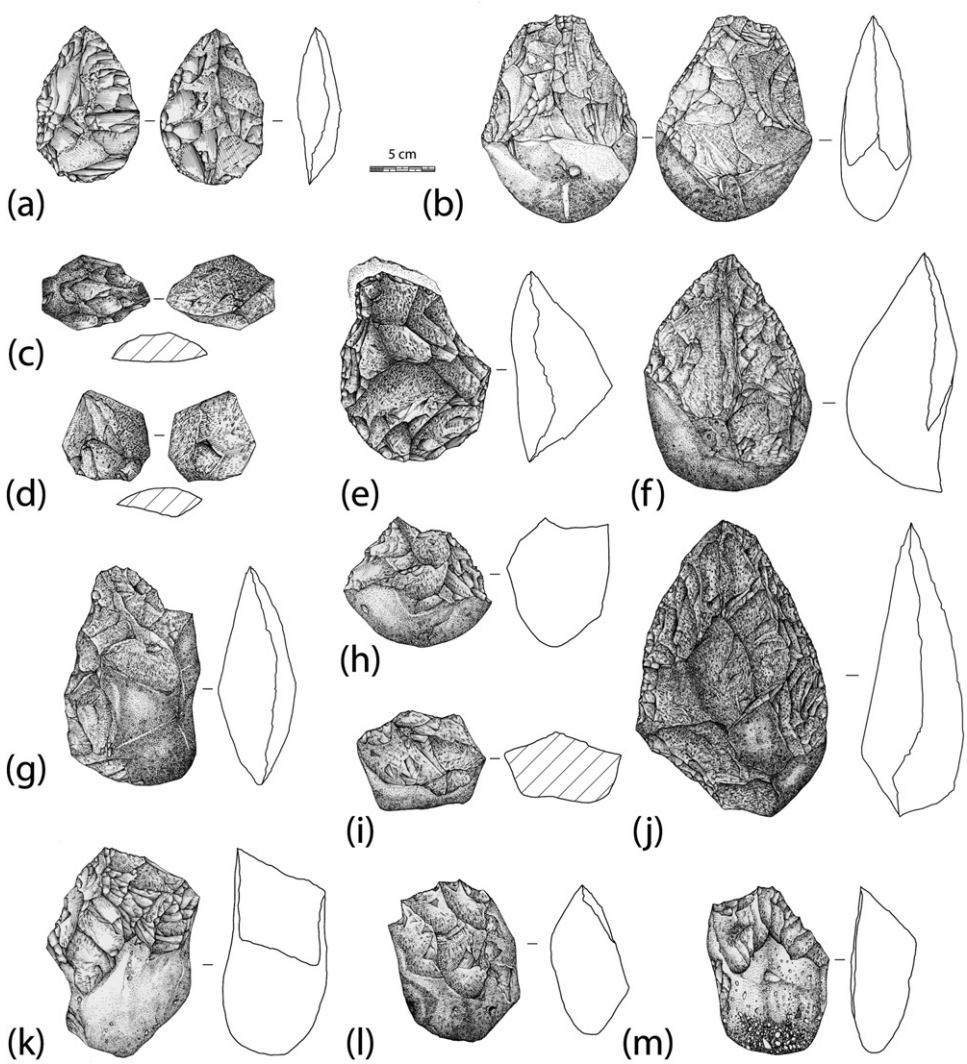

Fig. 3. Selected artefacts from Sao Din: a, b: bifacial piece; c, d: flake; e: unifacial cobble tool with a transverse-distal cutting edge and denticulated lateral side; f, j: convergent tool on a unifacial cobble; g: chopper with convex cutting edge; h, k: convergent chopper tool; i: discoidal chopper; l, m: chopper with denticulated cutting edge.

Fig. 3. Exemple de quelques objets taillés du site de Sao Din : a, b : pièce bifaciale ; c, d : éclat ; e : outil unifacial sur galet, avec bord tranchant transversal distal et denticulé latéral ; f, j : outils convergents sur galets unifaciaux ; g : chopper à bord tranchant convexe ; h, k : chopper avec outil convergent ; i : chopper discoïde ; l, m : chopper avec bord tranchant denticulé.

sedimentary deposits composed mainly of sandstone and shale. Meesuk and Shoosuwan (1980) classified the Quaternary deposits of the Na Noi Basin into three distinct levels based on geomorphological and lithological features: a high terrace, a low terrace and recent alluvial deposits. However, the results of our geological survey demonstrated that both terraces belong to a fluvio-lacustrine 'Plio-Quaternary' formation erroneously attributed to the Tertiary on the geological map (Hess and Koch, 1975), although no distinction is indicated between the Tertiary and Quaternary formations by Meesuk and Shoosuwan (1980). Furthermore, it is in fact possible to describe four different terraces: an upper terrace at +70 m, a middle terrace at +40 to 35 m and two lower terraces at +9 m and +5 m, respectively, above the present level of the Hum Nam Haeng River.

The geological materials forming the upper terrace include thick gravel beds with a silty to sandy matrix, interbedded within a silty-sand layer. These very poorly sorted gravel beds are composed mainly of volcanic rocks and quartzites ranging in size from 5 to 20 cm in diameter with the very coarse sediment ranging in size from 20–30 cm up to 50–60 cm. Deposited in a high-energy fluvial environment, these materials are found close to the mountain range up to 350 m above the sea level.

The middle terrace is observable at elevations between 300 and 320 m above sea level. A series of rock pinnacles result from the erosion of alternating semi- to unconsolidated layers of mudstone, sandstone, conglomerates and laterites. A 10-m thick outcrop from the lowest part of the terrace is characterized by clay, gravels and sand. This unit is overlain by a 2.5–3 m thick layer of mixed, poorly

sorted and rounded gravels together with sands composed of sandstone, quartz, well-bedded sandstones and silicified wood. A 2–3 m thick layer of moderately well sorted, sub-rounded to rounded gravels and sands composed of quartz and sandstone is also interbedded within this sub-unit. The uppermost sub-unit (approximately 50 cm to 1 m thick) is characterized by fine, reddish brown laterites. Although these alluvial deposits indicate a flood plain environment, they are associated with the colluvial remodelling of materials from the upper terrace which is also responsible for the deposition of the artefacts. Ferruginous encrustations are present below the uppermost level of the middle terrace and are found close to the area where the stone tools were recovered as a result of the erosion of middle terrace. Furthermore, this erosion event can be connected with the formation of the two lower terraces.

As the Nanoi Basin is only weakly connected to the main regional hydrological system (Mae Nan River), the rate in which the upper terrace was remodelled ultimately leading to the formation of the middle terrace, the mobilisation of iron deposits responsible for the encrustations present on the artefacts and the erosion of the uppermost layer of the middle terrace may have required several hundred thousand years. Finally, as neotectonic activity has been documented during the period between 68 and 34 ka in the nearby Phrae Basin (Won-in, 2003), the clarification of the exact chrono-stratigraphic context of the Sao Din site and the establishment of a more precise depositional history for the cultural material remain two of the projects future goals.

4. Preliminary concluding remarks

The lithic assemblage recovered from Sao Din is characterised by unifacial and thick cobble tools which rarely have a convergent edge (point) similar to other regional stone tool assemblages with few or rare handaxes such as those from India (Gaillard, 1996; Mishra, 1992; Padday et al., 2002), China (Hou et al., 2000), Korea (Kong and Lee, 2006; Norton, 2000; Norton et al., 2006; Yi, 2011) and southern Sumatra (Simanjuntak, 2009) where most material also lacks a stratigraphic context. A recent analysis of early Chinese assemblages from the Bose Basin and Korea suggested that, unlike the early Indian material, these large cobble tool industries can no longer be considered as 'Acheulean' such as it is defined in western Europe (Bodin, 2011). In other words, the so-called 'Acheulean' from China forms part of specific cobble technologies whose shape is dictated by the original form of the raw material, contrary to genuine bifaces whose form can be imposed on any type of raw material which "exhorts us to caution against imposing a simplistic, often outmoded view of western European prehistory on other regions... pointing out that there are independent trajectories of technological evolution in many parts of the world" (Otte, 2010:223). The Sao Din cobble tools differ from genuine Acheulean assemblages generally characterised by high proportions of handaxes (80% of the assemblage) and cleavers. However, like Early Palaeolithic assemblages from equatorial and inter-tropical environments in Asia, South Asia and Southeast Asia, the assemblage also contains a diversity of tool types made on 'cobble-supports' in various raw materials. Finally, the morphology of the Sao Din cobble artefacts reflects a local tradition more similar to southern Chinese assemblages dated between 1 Ma and 0.5 Ma (Xie and Bodin, 2007) than to the other Palaeolithic tools discovered from continental Asia or in Southeast Asian archipelago (Java and Sumatra) where there exists a different technical lineage with handaxes and cleavers dating to 0.8 Ma (Sémah, 2001; Simanjuntak and Forestier, 2008; Simanjuntak et al., 2010). Despite pioneering surveys carried out several decades earlier (Boriskovsky, 1966; Heider, 1960; Movius, 1943; Saurin, 1963a, 1963b, 1966, 1971; Van Heekeren, 1947), comparable information is still lacking from nearby countries such as Vietnam, Myanmar, Laos and Cambodia. New field surveys in these areas would likely provide material similar to the stone tools recovered from Sao Din.

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