



Human palaeontology and prehistory

Discovery of a Mesolithic burial near the painted rock-shelter of Ban Tha Si (Lampang province, Northern Thailand): Implications for regional mortuary practices

Découverte d'une sépulture mésolithique sous l'abri-sous-roche orné de Ban Tha Si (province de Lampang, Nord de la Thaïlande) : implications régionales sur l'évolution des pratiques funéraires

Valery Zeitoun^{a,*}, Prasit Auetrakulvit^b, Hubert Forestier^c, Antoine Zazzo^d, Gourgen Davtian^e, Supaporn Nakbunlung^f, Chaturaporn Tiamtinkrit^g

^a UMR 9993 CNRS-Musée Guimet, 19, avenue d'Iena, 75116 Paris, France

^b Department of Archaeology, Faculty of Archaeology, Silpakorn University, Na Phra road, 10220 Bangkok, Thailand

^c UMR 7194, CNRS MNHN, 1, rue René-Panhard, 75013 Paris, France

^d UMR 7209 CNRS-MNHN, 55, rue Buffon, BP 56, 75231 Paris, France

^e UMR 7264 Cepam, Pôle universitaire SJA3, 24, avenue des Diables-Bleus, 06357 Nice cedex 4, France

^f Northern Archaeological Center, Faculty of Social Sciences, Department of Anthropology, Chiang Mai University, 239, Huay Keaw road, 50200 Chiang Mai, Thailand

^g 6th Archaeological Division of Fine Arts Department, Nan Museum, Nan, Thailand

ARTICLE INFO

Article history:

Received 12 July 2012

Accepted after revision 12 September 2012

Available online 10 January 2013

Presented by Yves Coppens

Keywords:

Field anthropology

Mortuary practices

Hoabinhian

Rock art

Radiocarbon dating

Mots clés :

Anthropologie de terrain

Pratiques funéraires

Hoabinhien

Art rupestre

Radiocarbone

ABSTRACT

Although the oldest Neolithic cultures in eastern Asia have for the most part been documented in China and Vietnam, a large number of Early Metal Age sites have been reported in northeastern Thailand. On the other hand, the Hoabinhian, principally identified by its characteristic unifacial tools, is known throughout the Late Pleistocene up until 3000 BP and is spread across the whole of continental Southeast Asia. The chronology of Hoabinhian lithic assemblages is still poorly documented and burials from the period are scarce and often do not provide enough information to allow the evolution of regional mortuary practices to be investigated. Here we describe a burial dated to 7047 ± 53 BP found associated with a Hoabinhian stone tool assemblage and fauna near the painted rock-shelter of Ban Tha Si. This discovery provides important new chrono-cultural information for continental Southeast Asia, especially with regard to changing regional mortuary practices.

© 2012 Académie des sciences. Published by Elsevier Masson SAS. All rights reserved.

RÉSUMÉ

Alors que les cultures du Néolithique ancien d'Asie orientale ont essentiellement été décrites en Chine et au Vietnam, les cultures de l'Âge des Métaux ont abondamment été documentées dans le Nord-Est de la Thaïlande. Par ailleurs, le Hoabinhien, principalement identifié par ses outils unifaciaux caractéristiques, est connu du Pléistocène tardif jusque vers 3000 BP sur l'ensemble du Sud-Est asiatique continental. La chronologie des assemblages lithiques hoabinhiens reste encore peu documentée et les sépultures de cette période

* Corresponding author.

E-mail address: pythecanthro@gmail.com (V. Zeitoun).

sont rares et ne procurent ainsi que peu d'information permettant de suivre l'évolution des pratiques funéraires. Nous décrivons ici une sépulture inédite qui a été datée de 7047 ± 53 BP et qui est associée à un assemblage lithique hoabinhien dans l'abri-sous-roche orné de Ban Tha Si. Cette découverte apporte des informations chronoculturelles nouvelles pour l'Asie du Sud-Est continental et permet de dresser un premier panorama de l'évolution des pratiques funéraires de cette période.

© 2012 Académie des sciences. Publié par Elsevier Masson SAS. Tous droits réservés.

1. Introduction

Cave and rock-shelter paintings have been known for some time in Thailand (Kerr, 1924; Lunet de Lajonquière, 1912), and numerous new sites have been discovered and documented in the last 30 years. Painted figures belonging to different styles and periods have been identified in various regions, including the coastal areas of southern Thailand (Chaimongkol, 1988), the western part of central Thailand (provinces of Uthai Thani and Kanchanaburi) (Srisuchat, 1989, 1990, 1991), the North-East (provinces of Loei, Nakhon Ratchasima, Khon Kaen, Udon Thani and Ubon Ratchathani) (Charoenwongsa, 1988; Srisuchat, 1992), and northern Thailand (provinces of Hot, Chiang Mai, and Lampang) (Pautreau and Doy-Asa, 2005; Pautreau et al., 1996; Sidisunthorn et al., 2006; Srongsiri and Sangchan, 1997). Geometric forms, different types of animal representations (wild and domesticated), tools, boats, landscape and hunting scenes, hands and anthropomorphic figures have all been documented. Apart from modern scenes such as the Chinese junk from Phi Phi Island or white animal outlines, prehistoric rock art in Thailand mostly dates from the Iron Age and is associated with sedentary societies (Higham, 2002). Figures are usually painted in red ochre, such as at the Pha Taem rock-shelter in northeastern Thailand near the Mekong River, where figures of fishes, fish-traps, geometric forms, hands, deer in rice fields, and an elephant have all been recorded. At Khao Chan Ngam in the Nakhon Ratchasima region, anthropomorphic figures are present alongside cattle and dogs, whereas at the sites of Ban Yang Thong Tai near Doi Saket and at Ob-Luang cliff (Prisanchit and Pengtako, 1984; Santoni et al., 1988, 1990) in the province of Chiang Mai, red paintings depict both wild and domesticated animals. The largest painted rock-shelter in northern Thailand is that of Phratu Pha in Lampang province (Srongsiri and Sangchan, 1997). Although directly correlating the chronology of the paintings with associated human occupations or burials may be difficult, the occurrence of several burials at the base of Phratu Pha painted

rock-shelter (Kongsuwan, 2001; Srongsiri and Sangchan, 1997; Winayalai, 1999) dated to about 3000 BP prompted us to undertake excavations at Ban Tha Si because it depicts red painted hands and figures of animals. These new excavations uncovered a single individual buried in a flexed position associated with a series of radiocarbon dates (Table 1), indicating that the rock-shelter of Ban Tha Si was occupied for a significant duration.

2. Materials and methods

The site of Ban Tha Si was found during our surveys in the eastern cliffs of the Doi Pha Kan Mountains, 10 km south of the famous rock art site of Phratu Pha (Fig. 1, district of Mae Moh, Lampang province, N $18^\circ 26.55'$ E $99^\circ 45.98'$). Excavations at the site were undertaken in collaboration with the Northern Archaeological Center of Chiang Mai University, the Department of Archaeology of Silpakorn University, and the 6th office of Fine Arts Department of Nan. Red painted figures of hands, an elephant and a sun-bear (Fig. 2) were recorded exclusively on the eastern slopes of the mountain, as is also the case at nearby Phratu Pha. A total of 48 stone tools, five potsherds and one cowrie were uncovered from a survey of the rock-shelter. An initial 5 m by 1 m trench, excavated at the base of the elephant painting, produced only four stone tools near the surface. It is clear from this trench that the site has been heavily eroded, and the bedrock now lays only 5 to 10 cm below the present surface of the rock-shelter. The deposits are composed of fine aeolian sediments covering the eroded surface of the limestone substratum. Excavations undertaken under the southern overhang of the rock-shelter indicated that the preserved deposits could be divided into two distinct stratigraphic units: an upper layer composed of a fine aeolian sediment, and a 2 to 20 cm thick layer consisting of a combination of the overlying fine sediment and small angular limestone gravels derived from the erosion of the underlying calcareous substrate. The irregular surface of the lower level is due to the erosion of the underlying limestone substratum. The excavations produced 10 cobbles or cobble fragments, 194 flakes, 20 chunks, 44 stone tools (scrapers, denticulated pieces, retouched flakes, *limaces*) and 85 sherds (<0.5 cm wide) of black cord-impressed ceramics; all archaeological remains were recovered exclusively from the lower layer. Small faunal remains ($n = 105$, bone fragments, shell and chitin) demonstrate the presence of crabs, land snails, and aquatic molluscs, as well as turtles, varanids, snakes, cercopithecids, muntjak, suids, and an unidentified large bovid. A single burial has also been documented and the original position of the body determined using techniques

Table 1

Radiocarbon dates from Ban Tha Si rock-shelter.

Tableau 1

Datation radiocarbhone des échantillons prélevés dans l'abri-sous-roche de Ban Tha Si.

Nature	Date #	^{14}C age (BP)	$\delta^{13}\text{C}$ (‰, VPDB)
Charcoal	Wk 29559	7664 ± 30	−27.4
Charcoal	Wk 29560	$11,393 \pm 36$	−28.9
Charcoal	Wk 29561	8621 ± 33	−26.9
Charcoal	Wk 29562	$10,637 \pm 35$	−25.8
Charcoal	Wk 29563	6673 ± 25	−26.2
Bone	AA 92549	7047 ± 53	−16.8



Fig. 1. Location of the Ban Tha Si rock-shelter.

Fig. 1. Situation géographique de l'abri-sous-roche de Ban Tha Si.

developed in field anthropology (Duday, 2009; Duday and Guillon, 2006; Duday et al., 1990).

3. Stratigraphy of the site

Sedimentological analysis indicates that the different layers of Ban Tha Si were heavily eroded, because the base of the rock-shelter has suffered from exposure to rain and wind, resulting in the removal of fine sediments. The stratigraphy is only locally preserved in a pocket beneath a large block that fell from the top of the cliff as well as under the remaining overhang of the southern part of the rock-shelter. The calcareous substratum is either exposed or covered by a maximum of 46 cm of sediments (Fig. 3). Archaeological remains were concentrated within a single archaeological layer that accumulated as a result of splash-creep processes (see Lenoble in Zeitoun et al., 2008, p. 30). Small potsherds of black cord-impressed ceramics known from the Neolithic to the Metal Age in Southeast Asia (Ha, 1985; Prisanichit, 2008) are present, but solely at the top of the archaeological layer, suggesting a more recent human occupation.

3.1. Stone tools

Stone artefacts recovered during excavations fall within the variability documented for the Hoabinhian (Forestier et al., 2005) (Fig. 4) and are very similar to the lithic material recovered from Moh Khiew in southern Thailand (Auetrakulvit et al., 2012). Two types of raw material were used by prehistoric knappers: siliceous limestone and cobbles. The siliceous limestone was reserved for the manufacture of lightly retouched stone tools with highly variable cutting edges. These tools were shaped by

simple retouch and bear denticulated, micro-denticulated or notched edges and can generally be classified as end-scrapers, scrapers, notches and the occasional *limace*. The debitage method is a basic 'alternating platform system' applied to small nodules in order to produce different flakes with plain butts and occasional elongated flakes usually transformed into side scrapers. The majority of tools produced on the site were however basic retouched flakes. The second main tool group consists of cobble tools (or typical choppers) generally having a transverse denticulated or straight cutting edge on a single face. This type of heavy-duty tool is reminiscent of the classic Hoabinhian toolkit known from Southeast Asia and contrasts with the other chipped stone artefacts recovered from the site. Various tool functions associated with two different technical systems are perceptible in the Ban Tha Si toolkit: the shaping of cobbles on the one hand and flake production on the other, representing an adaptive technical response to living in a tropical environment.

3.2. Faunal assemblage

The relatively poor ($n = 105$) and limited faunal assemblage recovered from Ban Tha Si contains species typical of the region's Holocene fauna: small crab remains, land snails, aquatic molluscs, turtles, varanids, snakes, cercopithecids, muntjak, and some cut-marked suid bones. The largest piece is a fragment of a bovid long bone. In the contemporaneous levels of Moh Khiew rock-shelter, most of the faunal remains are also small animals weighing up to 10 kg and are typical of assemblages associated with the region's hunter-gatherer groups: turtles, monkeys, langurs, monitor lizards, squirrels, etc. (Auetrakulvit, 2004a, 2004b; Hongo and Auetrakulvit, 2011).



Fig. 2. Red ochre painted figures from Ban Tha Si: a) hands; b) elephant; c) hand; d) sun-bear.

Fig. 2. Figures peintes ocre-rouge du site de Ban Tha Si : a) mains ; b) éléphant ; c) main ; d) ours des cocotiers.

3.3. Description of the grave

The grave of a single individual was found close to the wall beneath the southern end of the rock-shelter's overhang. The grave is orientated northeast-east/southwest-west, the feet to the southwest (Fig. 5). The body was positioned on its right side, the head is absent, and the lower and upper limbs are flexed with the hands close to where the chin would have been. The individual was buried directly in the soil. Based on detailed field observations, the sediment rapidly replaced the volume of the corpse, which was still in anatomical articulation. Apart from the differential preservation and decay of the bones themselves, there is no evidence of disturbance, suggesting that the grave was

probably not much larger than the body itself. The sex of the male individual was determined at 98% confidence using the DSPV method (Murail et al., 2005) applied to the pelvis and coxal bones. The height of the relatively tall individual is estimated to be between 1.71 and 1.76 m according to Chusiri's (1991) Regional Anthropological Tables, based on the maximal length of long bones.

3.4. Radiocarbon dating

A series of five radiocarbon-dated charcoal samples (Fig. 3 and Table 1) yielded a consistent series of dates ranging between $11,393 \pm 36$ BP (Wk 29560) and 6673 ± 25 BP (Wk 29563). Because no collagen was preserved in the

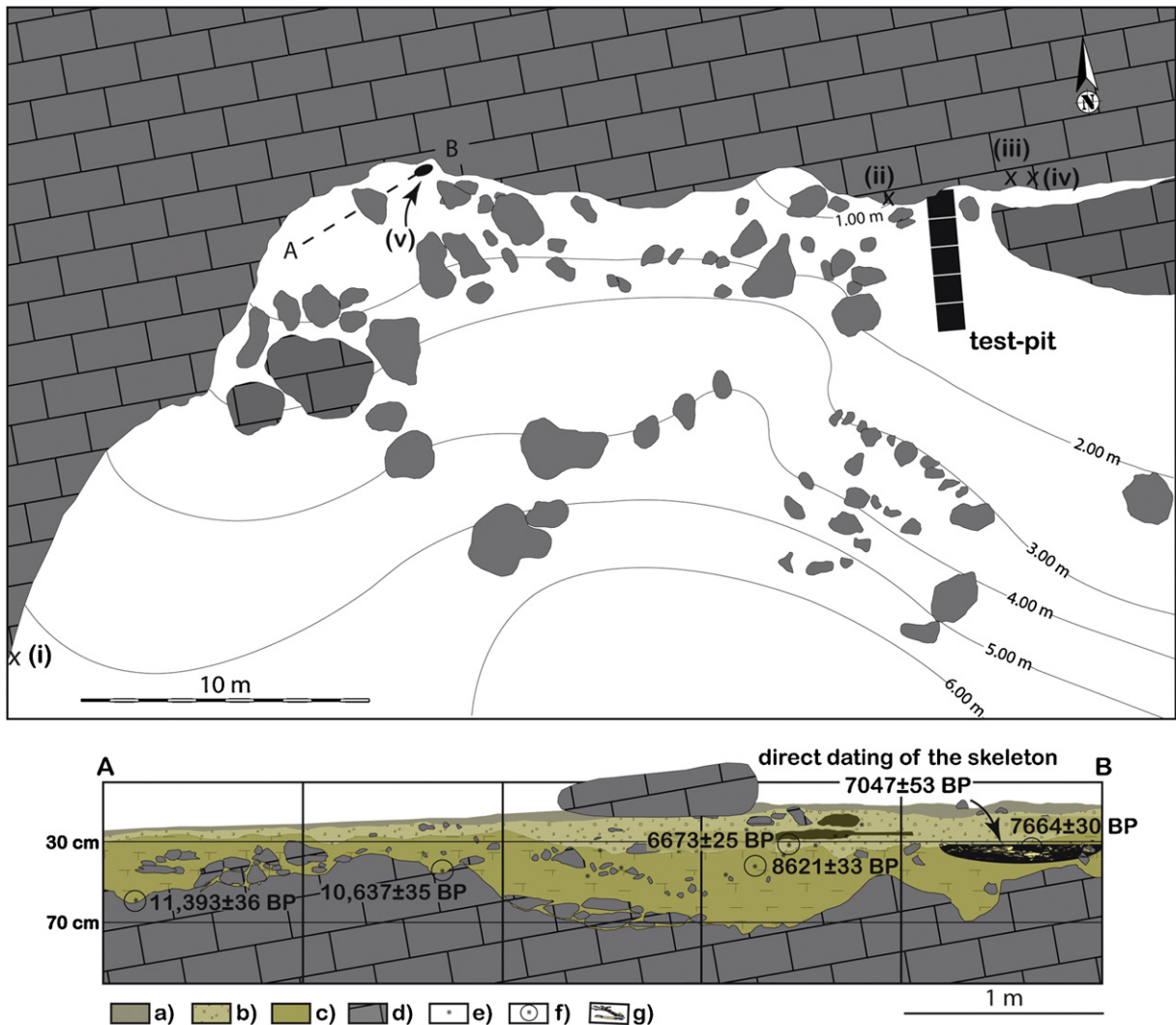


Fig. 3. Synthetic profile and plan of the Ban Tha Si rock-shelter: (i) hands; (ii) elephant; (iii) sun-bear; (iv) hand; (v) burial. A–B) Location of the profile: a) fine clayey sediment, b) yellow-brown clay; c) granulated calcareous stones mixed with yellow-brown clay; d) calcareous bedrock; e) charcoal; f) dated charcoal; g) human bones.

Fig. 3. Coupe synthétique et plan de l'abri-sous-roche de Ban Tha Si : (i) mains ; (ii) éléphant ; (iii) ours des cocotiers ; (iv) main ; (v) sépulture. A–B) Position de la coupe : a) sédiment fin argileux ; b) argile brun-jaune ; c) mélange de granulat calcaire et d'argile brun-jaune ; d) substratum calcaire ; e) charbon ; f) charbon utilisé pour la datation ; g) ossements humains.

human skeletal material, structural carbonate present in the mineral fraction of the bone (bioapatite) was sampled and produced an age of 7047 ± 53 BP (AA 92549). Radiocarbon dating of bioapatite has proved useful in arid environments where post-mortem chemical exchanges between bone and the burial environment are limited (Zazzo and Saliège, 2011). However, tropical environments are not ideal contexts for dating carbonate in bioapatites given that the humid climate is likely to promote chemical exchanges. To our knowledge, very few data concerning this technique have so far been reported from tropical environments. When altered, carbonate in bioapatite tends to return ages that are too young; therefore the age estimate should be considered a minimum age for the burial.

4. Discussion

Previous analyses of burial practices from Neolithic cemeteries defined distinct mortuary phases based on the depth, orientation and superimposition of graves, as well as associated grave goods (Higham and O'Reilly, 2004). However, the burial context itself, whether interred directly in the soil, in a coffin, or wrapped in fabric, represents a very important and under-evaluated aspect of funerary practices that is rarely included in Southeast Asian archaeological studies (Willis and Tayles, 2009). Mortuary rituals may be inferred from the nature and significance of grave goods, associated structures, and the size and spatial distribution of burials once the original position of the body has been determined based on techniques developed in field

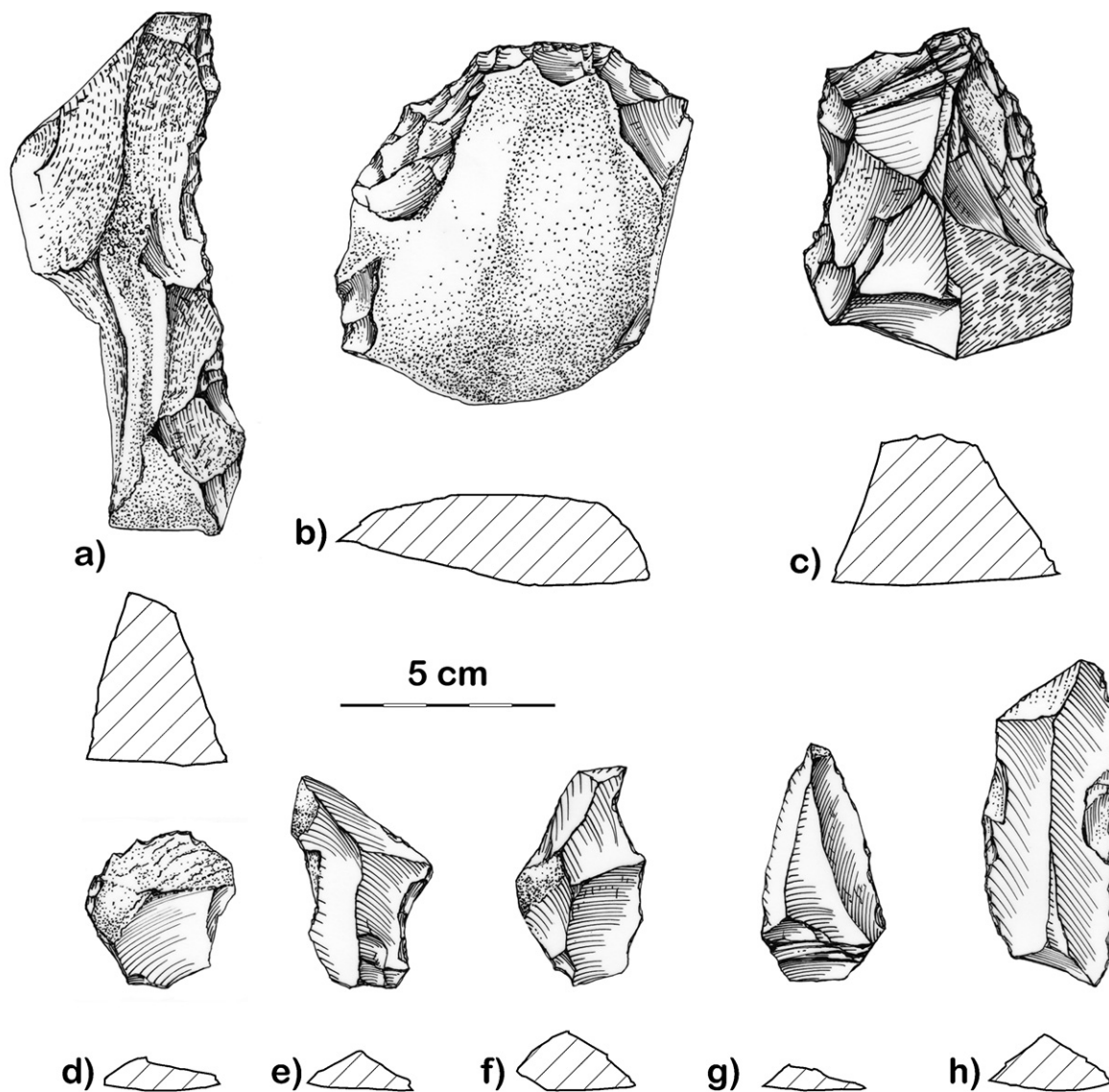


Fig. 4. Examples of lithic artefacts from Ban Tha Si rock-shelter: a) lateral denticulate on an elongated flake; b) unifacial cobble tool (chopper) with a transverse and convex denticulated cutting edge; c) thick retouched flake tool: *limace*; d) denticulated; e) double lateral notch, abruptly retouched; f) retouched flake; g) pseudo-Levallois point; h) retouched flake with two notches on both edges.

Fig. 4. Exemples d'objets lithiques de l'abri-sous-roche de Ban Tha Si : a) denticulé latéral sur éclat allongé ; b) outil unifacial sur galet (chopper) avec un bord tranchant denticulé transverse et convexe ; c) outil sur éclat retouché épais : *limace* ; d) denticulé ; e) double coche latérale retouchée ; f) éclat retouché ; g) pointe pseudo-Levallois ; h) éclat retouché avec coches sur les bords.

anthropology. Burial contexts are often left unidentified, despite [Duday et al.'s \(1990\)](#) insistence that they represent a fundamental component of mortuary behavior. Field anthropology, also known as archaeoethnology, employs meticulous observations of the anatomical orientation of bones in a grave to interpret how their original arrangement altered as the body decomposed, thus allowing the original burial context to be determined. Two actions determine the appearance of a grave: intentional human interventions and unintentional modifications resulting from taphonomic processes. The most important factors are interactions between the decomposition of the cadaver and gravity itself. As soft tissue decomposes, movements

due to gravity are either allowed by empty spaces in the grave or restricted by the lack thereof. By determining what types of spaces were present in the grave, it is possible to infer how the individual was initially interred ([Duday, 2009](#); [Duday and Guillon, 2006](#); [Duday et al., 1990](#)). Because this methodology has only recently been used in Southeast Asia ([Coupey et al., 2010](#); [Harris, 2010](#); [Pautreau et al., 2010](#); [Willis and Tayles, 2009](#); [Zeitoun et al., 2012](#)), it is necessary to reappraise ([Auetrakulvit et al., 2012](#)) earlier publications and data sets in order to make relevant comparisons.

Such a reappraisal is particularly warranted when discussing [Higham and Higham's \(2009\)](#) recent analysis of

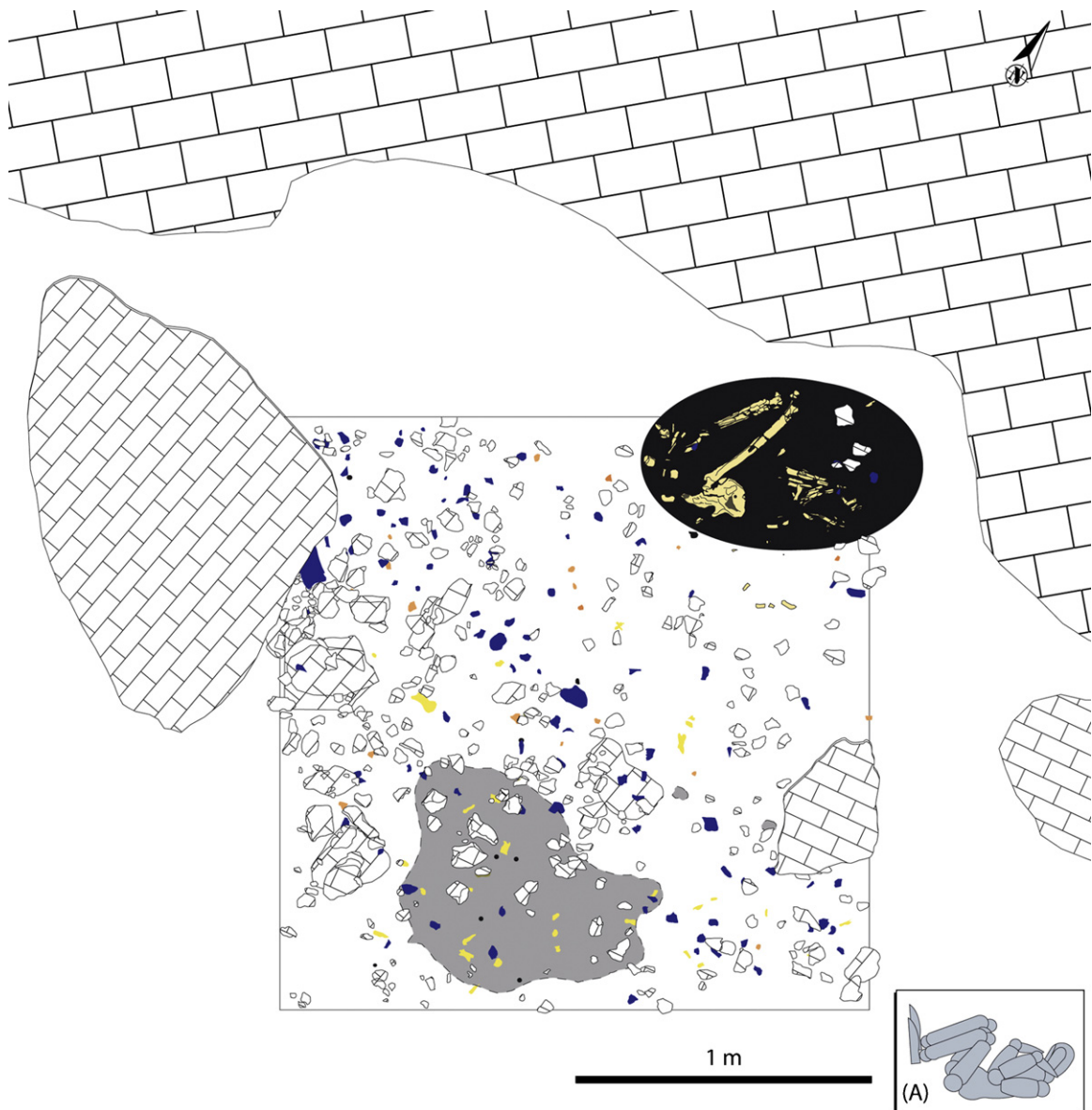


Fig. 5. Burial at the Ban Tha Si rock-shelter. A) Original position (hypothetical) of the individual in the grave.

Fig. 5. Sépulture de l'abri-sous-roche de Ban Tha Si. A) Position hypothétique du corps lors de l'inhumation.

Neolithic and Metal Age sites that considered flexed burials characteristic of the so-called indigenous Southeast Asian hunter-gatherers, whereas Rispoli (2007) considers southern China a 'spread zone' where Late Neolithic technological and cultural innovations originated and subsequently diffused across Southeast Asia. This expansion would include sedentism, agriculture, and ultimately the abandonment of chipped or flaked stone industries and is coincident with increased inhumations in the extended position, as opposed to the flexed position which may also reflect possible cultural influences from China.

By comparing the mortuary practices known from northern Thailand in the area of the two painted rock-shelters (Phratu Pha, Ban Rai) with the well-established chronology of burials documented at the site of Moh

Khiew, it is possible to trace changing mortuary practices in Thailand. The well-dated flexed burial from Ban Tha Si rock-shelter occupies an intermediate chronological position between the burials known from Neolithic and older Hoabinhian sites (Tham Lod and Ban Rai) and therefore sheds new light on changing regional mortuary practices.

4.1. Regional comparison of Hoabinhian burials

At the painted rock-shelter of Phratu Pha, 10 km north of Ban Tha Si, five individuals buried in supine positions with their limbs extended have been documented and could support the funerary trends described by Rispoli (2007) or Higham and Higham (2009). Furthermore, these 'extended burials' containing rice grains, bamboo and wood

have been radiocarbon-dated to between 3195 ± 55 BP and 2975 ± 65 BP. It should also be noted that one of the best-preserved burials is an adult individual directly interred in the soil in a supine position with upper and lower limbs extended and entirely wrapped in bark cloth. The burial has been directly dated to 3090 ± 60 BP, identical to the date of 3085 ± 70 BP obtained from rice grains recovered from a pot forming part of the associated grave goods (Winayalai, 1998). Nevertheless, the hypothesis of a 'new Chinese fashion' of inhumation still requires further investigation given the lack of secure chrono-cultural markers and detailed descriptions of burials in Southeast Asia capable of shedding new light on mortuary rituals such as those provided by field anthropology. The statement that the flexed burial from Ban Tha Si predates Neolithic examples suggests that the chronological and cultural significance of this type of burial also needs further revision. The scarcity of Upper Pleistocene to Late Neolithic Hoabinhian burials further complicates issues concerning the chronology of regional mortuary behaviour.

The features of Hoabinhian graves therefore provide no conclusive evidence of any standardisation or evolution of funerary practices in terms of the position of the body, the shape of the grave or the way the body was interred. Erosion, the presence of indistinguishable fills, or bioturbation often renders it impossible to discern and describe the shape of the initial grave. Finally, it is at least clear from other Hoabinhian sites in northern and southern Thailand that the so-called flexed position is not the sole mortuary practice associated with these hunter-gather groups. Indeed, three burials from the Hoabinhian level 3 of the Moh Khiew rock-shelter in southern Thailand (Fig. 6) have produced radiocarbon dates ranging from $11,020 \pm 150$ BP to 8420 ± 90 BP, and a single piece of charcoal from a fourth grave has been dated to $25,800 \pm 600$ BP (non calibrated) (Pookajorn, 2001). The two upper levels of this site also produced radiocarbon dates spanning 7060 ± 100 BP to 4250 ± 150 BP and contain potsherds of a mainly dark fabric or pottery with cord impressions (Pookajorn, 2001).

Different types of burials are not observable between the lower and upper portions of the sequence (Auetrakulvit et al., 2012, Fig. 6). The incomplete remains of an adult individual, placed on their back and oriented north-south with the upper part of the body lying extended under a large limestone block, was found in the lowest level. Two juveniles were buried in extended positions, oriented north-south with their heads to the south in the upper level. An adult individual buried in a half-flexed position with the upper part of the body on its back and lower limbs in a flexed position resting on the left side of the body was uncovered in the same level, but in the level overlying the two juveniles. In order to re-evaluate these mortuary practices, new excavations were carried out in 2008 and uncovered several new primary burials including an incomplete adult skeleton in a supine position with the head turned towards the west. Although the base of this burial cuts into the lowest level, the majority of the remains were concentrated in the overlying level which has been dated by a series of new radiocarbon determinations to between $11,220 \pm 510$ BP and 9470 ± 420 BP.

Three other burials have been uncovered at the top of the same level 3 as those excavated by Pookajorn (1990, 1994, 2001), including an incomplete skeleton of an adult lying in a supine and possibly half-flexed position in an almost north-south direction, the head facing southeast. A second north-south oriented and poorly preserved individual was buried in a supine position, but with extended limbs. A final burial contained an incomplete individual with only the lower limbs and pelvis preserved. The individual was buried on their left side and in a flexed position.

Although available information is incomplete, it can nonetheless be supposed that the initial extended burials belong to the middle period of the level dated to around 10,600 BP, while the other extended and flexed burials are likely younger than the top of this level (e.g. around 7000 BP) based on the information provided by Pookajorn (2001). The date of 4200 BP from the overlying level in which the grave from the level 3 was cut likely represents a 'minimum' age for the burials. It is nevertheless impossible to precisely determine the chronology of the different types of graves (flexed, half-flexed and extended) at Moh Khiew given the resolution of available chronological information. However, only burials containing individuals in extended supine positions are present at the base of the chronological sequence and therefore significantly predate the appearance of the flexed burials or any new Chinese cultural influence as advanced by Rispoli (2007) or Higham and Higham (2009).

Burials known from Hoabinhian periods in northern Thailand include a very incomplete burial of an adult in an extended supine position found at Tham Lod rock-shelter, 46 cm below the surface, with a hammer stone lying on top of the lower limbs. The associated sediment has been radiocarbon-dated to $12,100 \pm 60$ BP (non calibrated) (Shoocongdej, 2006). Underlying this burial, at a depth of 90 cm, an individual buried in a flexed position on the left side was covered by a ring of five large cobbles with a radiocarbon date of the fill at $13,640 \pm 80$ BP (non calibrated). Both burials are from a level that contains cores, flakes and sumatraliths made from quartzite, mudstone, andesite and siltstone, which falls within the variability of the Hoabinhian.

Two human occupations are separated by a hiatus between 6000 to 3000 BP at Ban Rai rock-shelter, 12 km west of Tham Lod. The more recent occupation, dated to between 1200 to 2500 BP, is associated with log coffins, while the earlier occupation phase (10,600 to 7250 BP non calibrated) is characterized by an abundance of Hoabinhian stone tools and numerous faunal remains including large bovids, deer, monkeys, squirrel, turtle, freshwater fishes and shellfish, as well as land snails (Sidisunthorn et al., 2006). A single grave of an adult individual in a supine position with the lower limbs in hyperflexion and the knees and arms bent inwards was recorded at the site. The body was buried directly in the soil within a circular pit devoid of any ornaments or grave goods. The fill of the grave has been radiocarbon-dated to 9720 ± 50 BP (non calibrated) (Pureepatpong, 2006).

The relative chronology of the burials from Moh Khiew rock-shelter and available dates from Tham Lod both

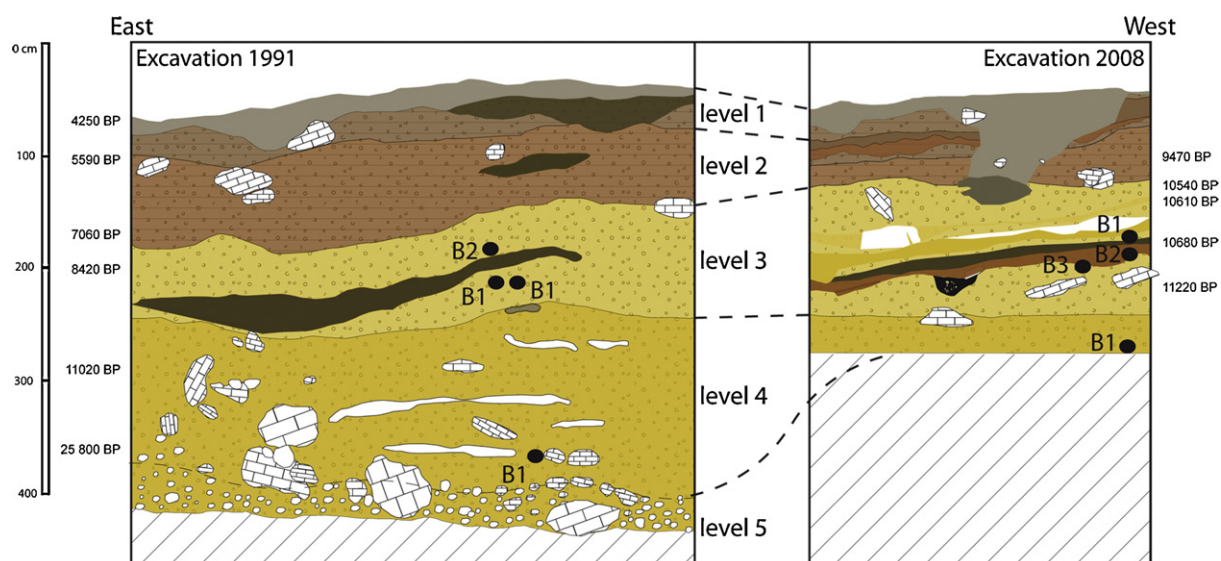


Fig. 6. Chrono-cultural typology of burials from Moh Khiew. B1. Burial of an individual in extended supine position. B2. Burial of an individual in flexed supine (half-flexed) position. B3. Burial of an individual in a flexed position, but on their side. According to Auetrakulvit et al., 2012, modified.

Fig. 6. Position stratigraphique des différents types de sépulture du site de Moh Khiew. B1. Sépulture d'individu enterré allongé sur le dos, avec les membres en extension. B2. Sépulture d'individu enterré sur le dos en position fléchie (semi-fléchie). B3. Sépulture d'individu enterré en position fléchie sur le côté. D'après Auetrakulvit et al., 2012, modifié.

indicate that extended burials predate flexed burials which, according to Rispoli (2007), originated in China and spread southwards during the Late Neolithic (4450–3450 BP). The directly dated individual burial at Ban Tha Si has produced an intermediate age of 7047 ± 53 BP.

5. Conclusion

Although there is a long history of rock-shelter occupations in Southeast Asia, it is not yet possible to determine the chronology and authorship of the cave paintings. While the majority of the lithic material from the long sequence of human occupations near the rock-shelters belongs to the Hoabinhian tradition, this does not constitute strong evidence because some of the paintings are linked with both agriculture and sedentism. One possible hypothesis is that different populations used the rock-shelters as funerary areas or as temporary camps, much like hunter-gatherer groups still living in the vicinity of such cliffs in southern Thailand (Pookajorn, 2001). Although the significant duration of the Hoabinhian lithic tradition provides an ideal opportunity for investigating the evolution of mortuary practices in Southeast Asia, the lack of detailed descriptions of burials based on methods developed in field anthropology, combined with direct dating of the skeletons, precludes building a solid database for testing hypotheses of migration or hypotheses concerning the spread of cultural influences. The reappraisal of field data from Moh Khiew or Tham Lod, as well as new excavations at Ban Tha Si, including field anthropology and direct dating, have provided the first concrete evidence contesting Chinese influences and produced earlier dates for extended burials.

Acknowledgments

The excavation was partially supported by the program ANR “Sedentism around the Mekong” AIRD. We thank Mr. Watana and Mr. Nattapon Sukitsuksawas from Chiang Mai University, the students of Silpakorn University: Wichaya Makhae, Jutinaj Borwornsachot, Pongpisit Kromkhan, Sirima Srathongruang, Waraporn Ratanawong, Chutima Sriratchai, Charnchai Srikanaya and Yantavee Suaesuebphan. We are also grateful to Mr. Chan Phiengsueb for his collaboration during fieldwork and to Mr. Methadol Wichakhana, Head of the 6th Archaeological Division of Fine Arts Department of Nan province, for providing us with the permit for the excavation and we thank Brad Gravina for editing the English version of this text.

References

- Auetrakulvit, P., 2004a. Exploitation des petites faunes par les chasseurs collecteurs du Sud de la Thaïlande : application à la préhistoire régionale. In: Brugal, J.P., Desse, J. (Eds.), *Petits animaux et sociétés humaines. Du complément alimentaire aux ressources utilitaires*. XXIV^e rencontres internationales d'archéologie et d'histoire d'Antibes. Éditions APDCA, Antibes, pp. 477–482.
- Auetrakulvit, P., 2004b. *Faunes du Pléistocène final à l'Holocène de Thaïlande : approche archéozoologique*. Thesis (PhD), University of Aix-Marseille I, 433 p.
- Auetrakulvit, P., Forestier, H., Khaokhiew, C., Zeitoun, V., 2012. New excavation at Moh Khiew site (Southern Thailand). In: Bonatz, D., Reinecke, A., Tjoa-Bonatz, M.L. (Eds.), *Crossing Borders in Southeast Asian Archaeology*. NUS Press, Singapore, pp. 62–74.
- Chaimongkol, S., 1988. Prehistoric culture on the Andaman east coast. *Spafa Digest* 9, 28–33.
- Charoenwongsa, P., 1988. The current status of prehistoric research in Thailand. In: Charoenwongsa, P., Bronson, B. (Eds.), *Prehistoric Studies: The Stone and Metal Ages in Thailand*. National Library of Thailand Cataloging in Publication Data, Bangkok, pp. 17–42.
- Chusiri, P., 1991. *The Principal Study of Human Skeleton*. Fine Arts Department, Bangkok, 160 p.

- Coupey, A.S., Pautreau, J.P., Kyaw, A.A., 2010. Second field season at Ywa Gon Gyi burial site (Upper Burma). *Bioarchaeology in Southeast Asia and the Pacific. Newsletter* 6, 17–18.
- Duday, H., 2009. *The Archaeology of the Death: Lectures in Archaeothanatology*. Oxbow book, Oxford, 158 p.
- Duday, H., Guillon, M., 2006. Understanding the circumstances of decomposition when the body is skeletonised. In: Schmitt, A., Cunha, E., Pinheiro, J. (Eds.), *Forensic Anthropology and Medicine Complementary Sciences from Recovery to Cause of Death*. Human Press, Totowa, New Jersey, pp. 117–157.
- Duday, H., Courtaud, P., Crubézy, E., Sellier, P., Tillier, A.M., 1990. L'anthropologie de terrain: reconnaissance et interprétation des gestes funéraires. *Bulletin et Memoire Societe Anthropologie de Paris* 2, 29–50.
- Forestier, H., Zeitoun, V., Seveau, A., Driwantoro, D., Winayalai, C., 2005. Prospections paléolithiques et perspectives technologiques pour redéfinir le Hoabinhien du Nord de la Thaïlande (campagnes 2002–2005). *Aseanie* 15, 33–60.
- Ha, V.T., 1985. Prehistoric pottery in Viet Nam and its relationships with Southeast Asia. *Asian Perspectives* 26, 135–146.
- Harris, N., 2010. *Disposing of dead: an investigation into prehistoric mortuary practices during the Neolithic and Bronze Ages at Ban Non Wat*. Thesis of Master of Science, university of Otago, Dunedin New Zeland, 199 p.
- Higham, C., 2002. *Early Cultures of Mainland Southeast Asia*. River Books, Bangkok, 375 p.
- Higham, C., Higham, T., 2009. A new chronological framework for prehistoric Southeast Asia, based on a Bayesian model from Ban Non Wat. *Antiquity* 83, 125–144.
- Higham, C., O'Reilly, D., 2004. Social aspects of the Ban Lum Khao cemetery. In: Higham, C., Thosarat, R. (Eds.), *The Origins of the Civilization of Angkor: the Excavation of Ban Lum Khao*. The Fine Arts Department, Bangkok, pp. 301–323.
- Hongo, H., Auetrakulvit, P., 2011. Ethnoarchaeology of the Mani (Orang Asli) of Trang province, Southern Thailand. A preliminary result of faunal analysis at Sakai cave. In: Albarella, U., Trentacoste, A. (Eds.), *Ethnozoarchaeology: the Present the Past of Human–Animal Relationships*. Oxbow books, Oxford, pp. 82–92.
- Kerr, A., 1924. Notes on some rock paintings in Eastern Siam. *Journal of the Siam Society* 18, 144–146.
- Kongsuwan, D., 2001. *A study of Mortuary practice at Phratu Pha archaeological site, Mae Mo, Lampang*. Master dissertation of Silpakorn university, 337 p.
- Lunet de Lajonquière, E., 1912. *Essai d'inventaire archéologique du Siam*. Bulletin de la commission archéologique de l'Indochine, Paris, p. 105–113.
- Murail, P., Brůzek, J., Houët, F., Cunha, E., 2005. DSP: a tool for probabilistic sex diagnosis using worldwide variability in hip-bone measurements. *Bull. Mem. Soc. Anthropologie Paris* 17, 167–176.
- Pautreau, J.P., Doy-Asa, T., Matringhem, A., Rodriguez-Lopez, E., Souhaité, S., 1996. Art rupestre en Thaïlande. *L'Archeologue, Archeologie Nouvelle* 19, 12–15.
- Pautreau, J.P., Doy-Asa, T., 2005. L'abri-sous-roche de Pha Mai. *Dossiers d'Archeologie* 302, 36–39.
- Pautreau, J.P., Coupey, A.S., Kyaw, A.A., Dupont, C., Gratuze, B., Lankton, J., Le Bannier, J.C., Maitay, C., Médard, F., Rambault, E., 2010. Excavations in the Samon valley. Iron Age Burials in Myanmar. Chiang Mai, Siam Ratana, Chiang Mai, 447 p.
- Pookajorn, S., 1990. Hoabinhian cave excavations in Ban Kao district, West Thailand. In: Glover I., Glover E. (Eds.), *Southeast Asian Archaeology. Proceedings of the first conference of the association of Southeast Asian Archeologist in western Europe*. Hands and Walker, Oxford BAR series 561, pp. 11–27.
- Pookajorn, S., 1994. Final report of excavations at Moh Khiew cave, Krabi province, Sakai cave, Trang province and ethnoarchaeological research of hunter-gatherer group so-called "Sakai or Semang" at Trang province. Department of Archaeology, Silpakorn University Press, Bangkok, 506 p.
- Pookajorn, S., 2001. New perspectives for Palaeolithic research in Thailand. In: Sémah, F., Falguères, C., Grimaud-Hervé, D., Sémah, A.M. (Eds.), *Origine des peuplements et chronologie des cultures paléolithiques dans le Sud-Est asiatique*. Semenanjung, Paris, pp. 167–187.
- Prisanchit, S., 2008. *Archaeology of Ceramics in Siam: Nan and Phayao Kiln sites*. Silpakorn Publication of the University Research and Development Institute, Nakornpathom, 298 p.
- Prisanchit, S., Pengtako, P., 1984. Report on Reconnaissance Survey of the Ob-Luang site 3, Northern Archaeological Research Project. Fine Arts Department, Bangkok, 76 p.
- Pureepatpong, N., 2006. Recent investigation of early people Mapha district, (Late Pleistocene to Early Holocene) from Ban Rai and Tham Lod rock shelter sites, Pang Mapha district, Mae Hong Son province, Northwestern Thailand. In: Bacus, E., Glover, I., Pigott, V. (Eds.), *Uncovering Southeast Asia's past*. NUS Press, Singapore, pp. 38–45.
- Rispoli, F., 2007. The incised and impressed pottery style of mainland Southeast Asia following the paths of neolithization. *East and West* 57, 235–304.
- Santoni, M., Pautreau, J.P., Prishanshit, S., 1988. Découverte d'un site préhistorique. *Archeologia* 236, 50–57.
- Santoni, M., Pautreau, J.P., Prishanshit, S., 1990. Excavations at Obluang, province of Chiang Mai, Thailand. In: Glover, I., Glover, E. (Eds.), *Southeast Asian Archaeology. Proceedings of the first conference of the association of Southeast Asian Archeologist in western Europe*. Hands and Walker, Oxford BAR series 561, pp. 37–54.
- Shoongdej, R., 2006. Late Pleistocene activities at the Tham Lod rock-shelter in Highland Pang Mapha, Mae Hong Son province, Northwestern Thailand. In: Bacus, E., Glover, I., Pigott, V. (Eds.), *Uncovering Southeast Asia's past*. Singapore, pp. 22–37.
- Sidisunthorn, P., Gardner, S., Smart, D., 2006. *Caves of Northern Thailand*. River Books, Bangkok, 392 p.
- Srisuchat, A., 1989. *Rock Art at Kanchanaburi*. Department of Archaeology FAD, Bangkok, 87 p.
- Srisuchat, A., 1990. *Rock Art at Khao Uthai Thani*. Department of Archaeology FAD, Bangkok, 87 p.
- Srisuchat, A., 1991. *Rock Art of the Historic Period in Thailand. Part I*. Department of Archaeology FAD, Bangkok, 96 p.
- Srisuchat, A., 1992. *Rock Art of the Historic Period in Thailand. Part II*. Department of Archaeology FAD, Bangkok, 75 p.
- Srongsiri, W., Sangchan, W., 1997. Phratu Pha, Lampang, Prehistorical Site, "3000 years" Rock Painting Ceremony at the Sacred Cliff. *Art and Culture Magazine*, Sujit Wongtate, Bangkok, 135 p.
- Willis, A., Tayles, N., 2009. Field anthropology: application to burial contexts in prehistoric Southeast Asia. *Journal of Archaeological Science* 36, 547–554.
- Winayalai, C., 1998. Prehistoric Rock Art at Phratu Pha, Mae Moh, Lampang. *Muangboran* 24, 117–122.
- Winayalai, C., 1999. *The study of Kai Phratu Pha rock painting site, Mae Mo district, Lampang province*. Master dissertation of Silpakorn university, 324 p.
- Zazzo, A., Saliège, J.F., 2011. Radiocarbon dating of biological apatites: a review. *Palaeogeogr. Palaeoclimatol. Palaeoecol.* 310, 52–61.
- Zeitoun, V., Forestier, H., Nakhunlung, S., 2008. *Préhistoires au Sud du Triangle d'Or*. IRD Éditions, 252 p.
- Zeitoun, V., Forestier, H., Sophady, H., Puaud, S., Billault, L., 2012. Direct dating of a Neolithic burial in the Laang Spean cave (Battambang Province, Cambodia): first regional chrono-cultural implications. *C. R. Palevol* 11, 529–537. <http://dx.doi.org/10.1016/j.crpv.2012.06.006>.