LATE STONE AGE COMMUNITIES IN THE THAI-MALAY PENINSULA

Henrik Lekenvall

University of Uppsala, Sweden
Email: lekenvall2@gmail.com

ABSTRACT

The paper presents the results from archaeological reconnaissance carried out in Rattaphum district in Songkhla Province, Thai-Malay Peninsula. The purpose of the investigation was to evaluate the potential of selected areas for further study, and to contribute to the understanding of the Late Stone Age communities in the area. Specific emphasis is put on evaluating the methodology employed during the reconnaissance, which was based on community involvement. The results from the reconnaissance are presented and discussed in terms of the prevailing discourse on agricultural development during the Late Stone Age. A review of the archaeology of the Thai-Malay Peninsula is given as a background. The archaeological reconnaissance revealed seven caves/rock shelters with primary (surface finds) or secondary (oral testimonial) evidence of Late Stone Age communities. However, no further conclusions on the agricultural transformation in the area can be made based on this study. More archaeological surveys and detailed site studies are needed.

Keywords: Thai-Malay Peninsula; Caves; Rock shelters; Agriculture; Late Stone Age; Local community; Archaeological reconnaissance; Environmental data

INTRODUCTION

Archaeological research in the Thai-Malay Peninsula (TMP) has predominantly focused on the development of urbanism in Satingphra and Kedah (Allen 1991; 1997, Stargardt 1973; 1976; 1983). Regional prehistory and the Late Stone Age (LSA) – early agriculturalists, in particular - have remained unexplored. Current knowledge on LSA communities is based on archaeological information derived from few, often very disturbed, cave and rock shelter sites. Polished stone implements, rock paintings and ceramics have been recovered at many locations on the peninsula, but the provenience of the remains has rarely been determined.

On the basis of the apparent similarities between the material culture recorded from the few sites discovered so far in the TMP, and archaeological remains found in other LSA contexts in the rest of Southeast Asia (SEA), it has implicitly been assumed that the TMP followed the same culture-historical trajectories as the rest of SEA (e.g. see Bellwood 2007, Higham 1989). As a result of this culture-historical interpretation, the nature of LSA communities and the formation of farming communities in the TMP remain poorly understood.

Archaeological reconnaissance was carried out by the author and archaeologists from the 13th Fine Arts Department (FAD), Songkhla. The archaeological reconnaissance was based on surface finds from caves and rock shelters, interviews with local informants on household collections, and museum visits. The use of local household collections represents a novel way of identifying suitable areas for surveying, and it also contributed to locating new archaeological sites. Moreover, it enabled local communities to become involved in the reconnaissance.

THE AGRICULTURAL SYNOPSIS

Agricultural development in SEA has usually been interpreted in relation to linguistics and the modern distribution of ethnic groups. The model is that Austroasiatic (AA) speaking and Austronesian (AN) speaking rice farming communities originated and spread from the Yangtze River Valley in southern China, the former by land, and the latter by sea (Higham 2002). The AA and AN expansion occurred between the mid-third and mid-second millennium B.C., and the AA dispersal probably began slightly before the movement of AN speaking groups (Bellwood 2007).

Current available data indicates that rice was domesticated in the Yangtze River Area in the early Holocene (Crawford 2012; Liu *et al*. 2007; Wang *et al*. 2010), or even as early as the late Pleistocene (Hai *et al*. 2007), but did not reach Thailand until the late third or early second millennium B.C. (Higham 2005). This inferred date of the dispersal of rice farmers in the region about 4000 B.P. corresponds rather well with the more recent excavations of stratified cultural layers at the site Ban Non Wat, which places the start of rice agriculture at 1650 B.C. (Higham and Higham 2009).

According to Bellwood (1993, 2007) and Higham (2002, also see Higham 1996), this migration of peoples led to cultural and socio-economic assimilation of Hoabinhian foraging groups by farming communities. Nevertheless, different socio-economies also co-existed in neighbouring and contemporary sites, creating a mosaic of cultural variation (Hutterer 1976, cited in Bellwood 2007: 155). This is exemplified by the hunter-gatherer

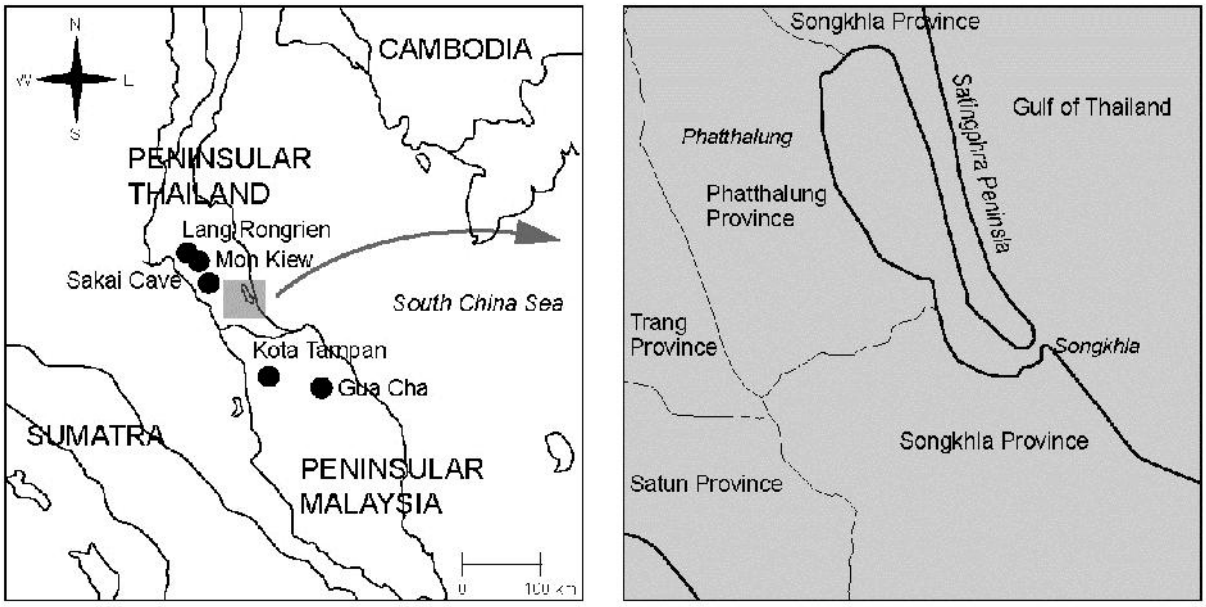

Figure 1: Map of southern SEA showing the research area and important sites mentioned in the text.

Site	Primary finds	Secondary finds	Oral testimony	Previous finds by the 13th FAD
Khao Rakian	-	-	Ground stone axe, ceramics, human skeletal remains (including 11 crania).	LSA ceramics, human skeletal remains.
Khao Nui	LSA ceramics	-	Ground stone axe, ceramics, human skeletal remains.	LSA ceramics.
Khao Khua	Historic and LSA ceramics	-	Human skeletal remains.	-
Khao Tok Nan	-	-	Ground stone tools.	-
Khao Joompa	-	Ground stone axe	-	-
Khao Chang Lon	Hammerstone	-	Ceramics, human skeletal remains, shells.	-
Khao Daeng	Historic and LSA ceramics	-	-	-

Table 1: The sites and archaeological finds associated with them.

populations which have persisted in parts of the TMP until the present (Albrecht and Moser 1996; Pookajorn 1991). The occurrence of LSA artifacts and human skeletal remains in cave and rock shelters has been interpreted as inhumations, which are linked with the arrival of farming communities during the LSA (Anderson 1997, Bellwood 2007).

However, for peninsular Thailand there exist no secure archaeological evidence for a change from a hunter-gatherer mode of subsistence to an agricultural one in the period between 4000 – 2500 B.P. Current archaeological data and environmental data do not support a rapid replacement of foraging communities by farming communities (Kealhofer 2003). The migration hypothesis has often found strong support by archaeologists working in SEA, but according to Kealhofer (ibid) environmental data rather point at long-term patterns of local and regional change. She has even proposed that an indigenous process of cultivation may have been present in the area early on.

EARLIER RESEARCH IN THE TMP

Excavations at the Long Rongrien Rockshelter site in Krabi, peninsular Thailand (Anderson 1988, 1990, 1997, 2005; Mudar and Anderson 2007), and at one of the sites in Perak peninsular Malaysia (Zuraina 1994, 2005, Matsamura and Zuraina 1999) have revealed human occupation in the region which dates back 40, 000 years. Occupation in the region is also evident from archaeological contexts dated to 26, 000 B.P. at the sites of Moh Khiew I and Sakai Cave in Krabi and Trang Provinces, respectively (Albrecht *et al*. 1993; Pookajorn 1991, 1994, 1996). (Figure 1). During the period between 22, 000 – 14, 000

B.P., there is a gap in the archaeological record. This has been attributed to rising sea levels as it has been assumed that some people resided in caves and rock shelters in coastal tracts which today lie under water (Auetrakulvit 2005: 50-51; Srisuchat 2005: 33).

The archaeological data of the TMP from 12, 000 – 5000 years B.P. primarily derive from cave and rock shelter sites, and are associated with Hoabinhian cultural remains (Adi 2005: 46). Hoabinhian assemblages are radiocarbon-dated to between 18,000 – 3000 years ago (Bellwood 2007: 158). In Thailand, these sites are Lang Rongrien and Khiew II in Krabi Province, and Thung Nong Nien and La Sawang in Satun Province (Auetrakulvit 2005: 50-62). In Malaysia, the sites of Gua Sagu, Gua Kechil and Gua Peraling in Pahang, Gua Taat in Terengganu and Gua Cha, in Ulu Kelantan (Adi 2005: 47) and Kota Tampan in Perak (Zuraina and Tjia 1988) are associated with the same cultural tradition. Open sites associated with Hoabinhian remains include (the now destroyed) shell middens in Malaysia (Adi (1983: 53-54).

The total number of recorded Stone Age sites in peninsular Thailand has been estimated to be about fifty by Srisuchat (1987, 1997, cited in Anderson 2005: 144). For peninsular Malaysia, Adi (2005: 47) has estimated the number of sites to be more than 100. Yet, around 60 sites were recovered alone in Surathani Province, peninsular Thailand, during an archaeological survey by the 13th FAD in the 1980s. Three caves, Tham Pak Om, Tham Bueng Bab and Khao Kichan were excavated. The sites are associated with Hoabinhian and Neolithic remains (Fine Arts Department, 1986). Excavations at Khao Rakian Cave in Songkhla Province have also revealed LSA remains in this area (13th Fine Arts Department, 1986).

Stargardt report a presence of secondary burials with skulls and long bones in caves and rock shelters in Phattalung Province (1983: 4; 2003: 104) on the western side of the Songkhla Lakes, which are probably associated with LSA communities. Rock paintings have been recorded in context with Hoabinhian and Neolithic surface finds in caves and rock shelters in Phangnga, Krabi, Trang, Satun (Chaimongkol 2005: 90-94) and in Yala (Limwijitwong 2005: 97), Kanchaburi Provinces and peninsular Malaysia (Adi 2005; Tan and Chia 2011). The 13th FAD has also recently carried out archaeological surveys in Satun and Songkhla Provinces, which resulted in the recording of several LSA archaeological sites (Limwijitwong, pers.comm., 10 October 2011).

For the TMP, archaeological evidence of rice agriculture is later than that found at the site of Ban Non Wat (Higham and Higham 2009). In peninsular Thailand, rice agriculture is argued to have begun around the Isthmian Lakes from c. 2500 – 2200 B.P. (Stargardt 1983: 31; *c.f.* Allen 1990). However, more recent data suggest an early presence of domesticated rice in peninsular Thailand. The analysis of ceramics found in a LSA context from the site of Khao Lamu Cave in Satun Province, has revealed remains of rice husks in the ceramics. Using a microscope on three samples showed the earthenware consisted of rice husks of various shapes, which could indicate rice domestication (Asawamas 2008: 39).

AREA DESCRIPTION

Songkhla Province is the main focus of this study. (Figure 2). The landscape surrounding the sites is characterized by a valley-like depression and is surrounded by higher elevated terraces. Presently in the area, rice agriculture is the most common land-use practiced, followed by field crops, vegetable plantations and fruit tree plantations (Forestry Statistics of Thailand 2007). The uplands are generally characterized by rubber tree and orchard plantations. Land use is mainly attributed to rice agriculture and other crops in the western margins of the Great Lakes, Thale Noi, Thale Luang, and Thale Sap Songkhla (Omakupt 1972; Panapitukkul *et al*. 2005). (Figure 3).

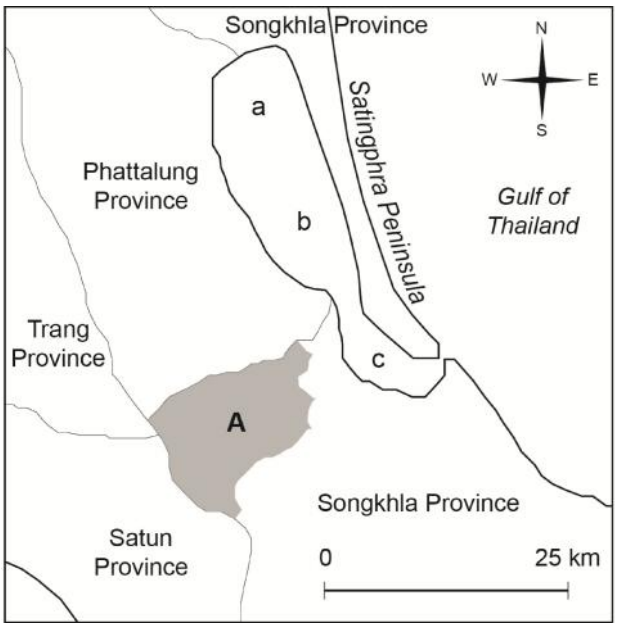

Figure 2: The research area. A: Rattaphum district, Songhkla Province where the main fieldwork was carried out.

Geologically, the research area comprises a western mountain spine of granitic and residual mountains (Dheeradilok *et al*. 1992: 745), consisting of loams of shales, conglomerates, limestone and intrusions of gneiss. (Figure 4). High sandstone and quartzite terraces run parallel with the mountain range, intersected with lower alluvial terraces of semi-recent and old alluvium (Pendleton 1949; Virgo and Holmes 1977: 209). (Figure 5). Lithic sources are abundant in the region. Metamorphic rocks in the form of hornfels, quartzite, shale, sandstone and chert, all occur frequently. Igneous rock types, such as basalt, are also present.Lower perennial river wetlands consist of meandering rivers and riverine marshes. From the western margins of the Isthmian Lakes and eastwards the topography is more or less flat except for the cluster of hills at Khao Daeng (Red Mountain) and Khao Ko Yai (Big Mountain Island) (Stargardt 1976).

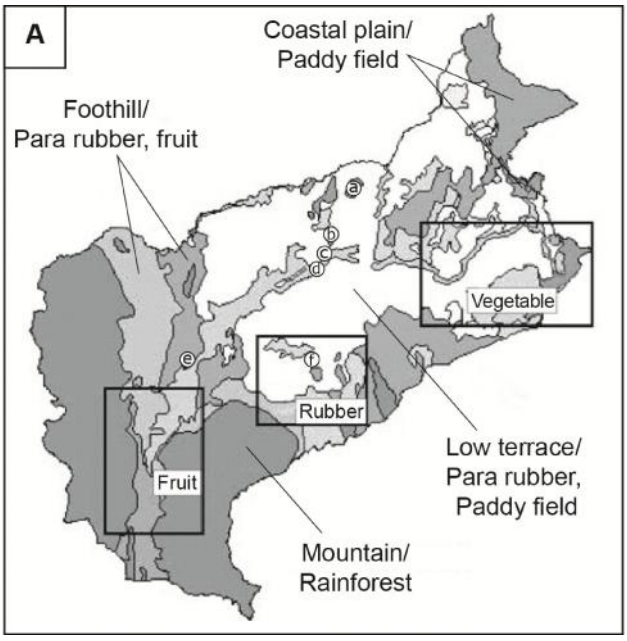

Figure 3: Current land use and topography in Rattaphum district and the sites found during reconnaissance. ⓐ: Khao Chang Lon Mountain. ⓑ: Khao Khua Mountain. ⓒ: Khao Joompa Hill. ⓓ: Khao Tok Nan Hill. ⓔ: Khao Nui Mountain. ⓕ: Khao Rakian Mountain. Modified from Panapitukkul et al (2005).

Pollen analysis from the sediment sequence of Thale Noi lake basin in the coastal zone indicates that the area around the Satingphra Peninsula was covered by mangroves 8500 cal. yr B.P. They were replaced by a freshwater swamp between 7880-7680 cal. yr B.P. During the time period of 2720 – 2350 cal. yr B.P., the freshwater swamp transformed into a peat swamp before burning resulted in the destruction of the swamp forest (Horton *et al*. 2005: 1202-1205).

Considering that sediment accumulation in this tropical region is fast, many sites have probably been buried by dense sediments. With this knowledge, the archaeological reconnaissance concentrated on higher elevated areas in the interior as these areas, presumably, suffered less from sea level variations and alteration of the landscape. Another reason for focusing on this area was that environmental data from the inland of Krabi Province (Kealhofer 2002, 2003) indicates that an indigenous process of cultivation may have been present in the interior of the TMP.

SURVEY METHODOLOGY

Three strategies were used to identify possible LSA sites in TMP: museum and temple visits, ethnographic interviewing, and cave and rock shelter reconnaissance. Buddhist temples traditionally curate artifacts found by the local community as people make merit by presenting such offerings to temples. Therefore, many museum collections derive from the temples (Chaorenpot *et al*. 2008: 45). Museums and temples were visited to record archaeological finds, which mostly consisted of Stone Age material.

The dense forest vegetation made systematic transect surveys difficult and time consuming. Identifying suitable areas for investigation, and as a starting point, archaeological sites were identified through formal interviews and informal talks with monks and the local community (*c.f.* Karlström 2009: 95-96; Källén 2004: 77, on a similar survey strategy). Monks and local residents were interviewed to identify potential sites of interest as well as artifact scatters found in the area. The informants were informed of our objectives and shown some examples of artifacts that could potentially be found in the area, and objects villagers are also known to collect, such as polished stone axes.

Previous surveys and excavations indicate that prehistoric sites are most likely to be found in the karst limestone areas of the TMP (Anderson 1997, 13th Fine Arts Department). Thus, the Songkhla and Phattalung Provinces was determined as suitable for reconnaissance. The purpose of the reconnaissance was to find LSA archaeological sites and artifacts, and the fieldwork was conducted in May-June 2009 jointly with the 13th FAD.

In total, the reconnaissance revealed seven locations within the mountains/hills (*Khao*=mountain/hill in Thai) - Khao Rakian, Khao Nui, Khao Tok Nan, Khao Joompa, Khao Khua, Khao Chang Lon and Khao Daeng - with primary (surface finds) or secondary (oral testimonial) evidence of archaeological material associated with the LSA. Of these, Khao Rakian, Khao Nui, Khao Khua and Khao Daeng were sites which were previously known by the 13th FAD. The sites were inspected by using field walking and visual inspection inside and in the nearby area of the sites. The archaeological sites need to be complemented by more detailed site studies in the future.

RESULTS

Seven mountains/hills were identified/revisited and had evidence of artifacts found in the vicinity, and oral testimonies associated with them. The sites are located in Rattaphum district, in Songkhla Province, except for Khao Daeng, which is situated in Phattalung Province. Therefore, Khao Daeng is not mapped or part of the site analysis in GIS. All of the sites are located in a rural environment, and are surrounded by scattered houses and cultivated lands. They have all been heavily disturbed by local farmers, who have removed soil to use it as fertilizers in agriculture. Thus, possible cultural layers and most opportunities for excavation have been lost.

Khao Rakian

Khao Rakian Cave was previously excavated in 1986 by the 13th FAD. The excavations revealed LSA material and suggested a nearby settlement. The team found LSA ceramics and skeletal remains from the cave in 1986 (The 13th Fine Arts Department, 1986). Moreover, local informants stated that a polished stone axe and ceramic pots containing bones were found 30-40 years ago inside the cave. According to the chief of the village, human skeletal remains, including 11 crania have also been found inside the same cave a few decades ago when local farmers dug

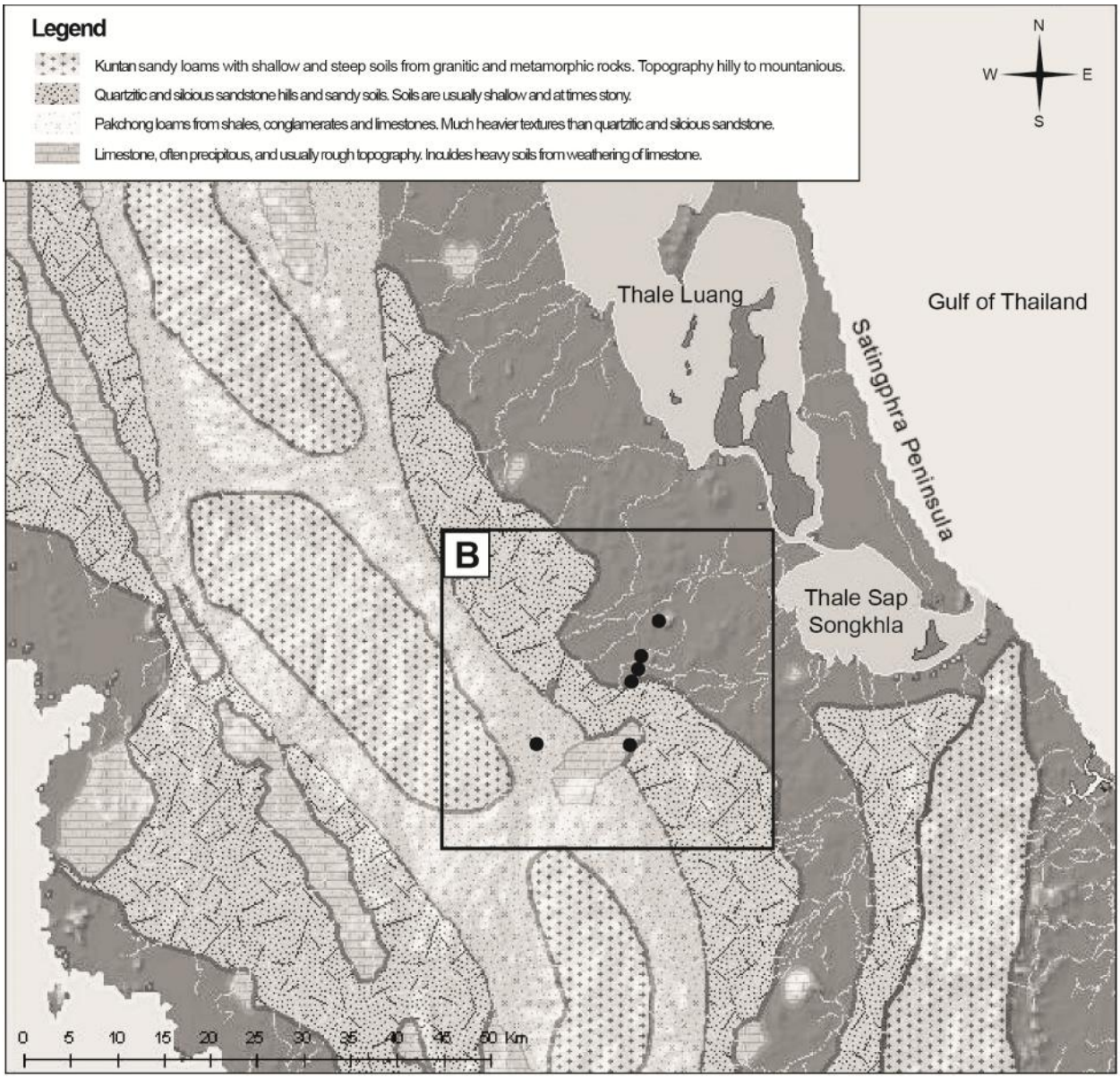

Figure 4: Geological land forms and the sites found during archaeological reconnaissance.

there for fertilizer. These finds were made before the 1986 excavation, and the cave had thus already been disturbed at the time of the excavation.

Khao Nui

According to the 13th FAD, the main cave in Khao Nui, Sekysoune Cave, has previously been surveyed but the date of the survey is unknown. LSA ceramics were found at that time. Today the area is severely disturbed as a new tourist center is under construction in the area. A quick inspection of the Sekysoune Cave showed no evidence of archaeological remains. However, LSA ceramics were found in a rock shelter nearby. According to the villagers living in the proximity of Khao Nui, ceramic vessels and human skeletal remains had been found in the Sekysoune Cave in the past. But the location of the actual find spot remains unknown. The original location in the rice field nearby of a single ground stone axe was identified by our local guide.

Khao Khua

Khao Khua Cave was surveyed by the 13th FAD in 2007 but no artifacts were found at that time (13th Fine Arts Department, 2007). During our survey we found ceramics. Whereas most of the ceramics were historic, one sherd was considered prehistoric as it resembled prehistoric ceramics found elsewhere. However, the sherd was fragmented and in a bad state of preservation. Therefore, the origin and age of the sherd were hard to determine. Local residents have reported that human skeletal remains had been found in Khao Khua Cave in the past (ibid). We were also told during our fieldwork that local residents had found skeletal remains in the cave. Ceramics were

also recovered in the agricultural fields of the area but these were believed to be historic.

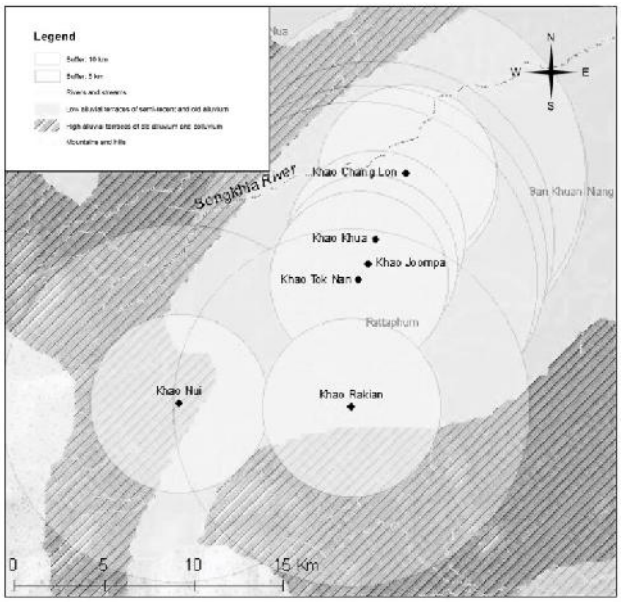

Figure 5: B: The sites seen in relation with the different environmental features.

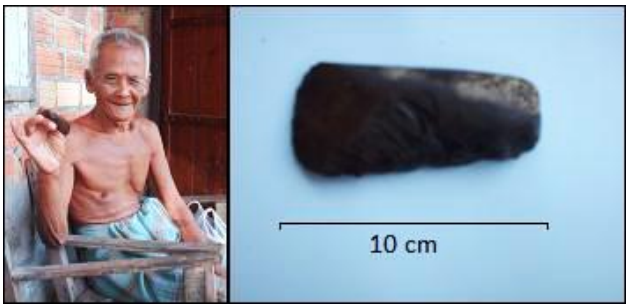

Figure 6: Polished stone axe found in the vicinity.

Khao Tok Nan

Two cave entrances were found during the survey of Khao Tok Nan, but it is probable that they constitute different entrances to the same cave. It was possible to enter into the first chamber at one of the entrances but the steepness of the cave prohibited further exploration. No surface finds were made. An elder local resident informed us he had found a polished stone axe in the entrance of the cave a few decades ago as a child. The axe could not be documented as its current location is unknown. Moreover, according to a monk in the local temple, a rock shelter had once existed in the southern part of the hill close to the canal. Stone tools had also been found around the rock shelter. However, the rock shelter has collapsed since then. Two polished stone axes had also been found during the construction of the Khlong Paum Canal a few decades ago.

Khao Joompa

Khao Joompa is located in the proximity of Khao Khua and Khao Tok Nan. The path to this cavern-like structure was hard, and access to its interior demanded climbing equipment. Surprisingly, the cave had been disturbed, and soil appeared to have been removed from the bedrock-floor. While the cave did not reveal any archaeological evidence, contact with local residents did suggest the presence of archaeological sites in the area. A polished stone axe was in the possession of an elderly person living in the vicinity of the hill. He used it (together with several other items) in a Buddhist ceremony called *kheun ban mai*, but the exact find spot is not known.

Khao Chang Lon

The local community confirmed the presence of four caves in Khao Chang Lon Mountain. Two of them were small and very disturbed. No surface finds were recorded at either one of the caves. One of the two remaining caves, Khao Chang Lom, was visible from ground level. It is a big cave with one main chamber and many small chambers. In one of the smaller chambers a hammer stone was found. The fourth cave, Tham Kra Duk, is situated at a higher altitude than the previous caves. No surface finds were recovered here.

According to the local informants, human bone remains have previously been found in Khao Chang Lom and Tham Kra Duk in association with ceramics. Human bones, including a cranium from Tham Kra Duk, indicate that humans were buried in the cave in the past. These kinds of human burials are part of local oral tradition. Vast amounts of shells have also been reported from Khao Chang Lom but the specific species of mussel/snail remains found have not been identified.

Figure 7: Khao Chang Lom Cave situated at the foot of the mountain.

Khao Daeng

In Khao Daeng Rockshelter in Phattalung province both prehistoric and historic ceramics were found in association with an altar and near the wall of the rock shelter.

Most of the ceramics were historic but one or two of the sherds were most likely of LSA origin. The ceramics were identified through the red/brown/yellow color and cord mark design on the sherds, which was similar to LSA ceramics reported elsewhere (*c.f.* 13th Fine Arts Department 1986). According to the personnel at the 13th FAD, the rock shelter has previously been cursorily surveyed (year unknown) but no surface finds were recorded at that time.

MUSEUM COLLECTIONS

Five museums were visited with the objective of making a quick inventory of their collections. However, the inventory must be complimented with more detailed artifact description in the future, which should involve numbers and types of artifacts. In short, Songkhla National Museum exhibited polished stone tools with cutting edges, polished stone axes and polished stone adzes. Wat Matchimiwat Temple Museum in Songkhla city also displayed more than a dozen stone artifacts associated with the LSA. Thaksin Folklore Museum in Songkhla Province exhibited LSA stone axes and ceramics. In Satun National Museum the artifacts displayed consisted of LSA ceramics. The exhibition of the Nakhon Si Thammarat National Museum includes large quantities of stone implements.

The provenance of the archaeological objects in the museum collections is usually undocumented. According to museum personnel, the archaeological objects in Songkhla and Wat Machimiwat museum derive from the local community. In Thaksin Folklore Museum the items have been donated from other provinces in southern Thailand. The provenance of the ceramics in Satun Museum is not known but the same type of ceramics has been discovered elsewhere in the province (*cf.* Awasamas 2008). The Satun Museum collection also resembles some of the ceramics found during the archaeological reconnaissance. According to museum staff, the artifacts in Nakhon Si Thammarat Museum mainly derive from excavations and surveys conducted in the Nakhon Si Thammarat, Surathani and Krabi Provinces.

DISCUSSION OF RESULTS

The archaeological reconnaissance revealed seven locations with potential LSA sites - Khao Rakian, Khao Nui, Khao Tok Nan, Khao Joompa, Khao Khua, Khao Chang Lon and Khao Daeng - with primary (surface finds) or secondary (oral testimonial) evidence of archaeological material associated with LSA communities. The results of the reconnaissance, information gathered from local residents, the material in the museums and our knowledge of sites in peninsular Thailand have been analyzed using *geographical information systems* (GIS), which allow us to interpret them within a larger landscape context.

The sites are situated in limestone outcrops overlooking the lower ground level plains and inland swamps, and along low terraces of semi-recent and old alluvium. Numerous rivers and streams intersect the landscape, with a concentration of watercourses around the sites, which suggests that water accessibility did not constitute a problem for the LSA communities. Songkhla River was probably used for mollusc gathering and fishing, and perhaps also for transportation to adjacent coastal areas. Water is also important for the cultivation of crops. The soils in the site area are today used for cultivation of crops (Forestry Statistics of Thailand 2007).

Since all sites are associated with LSA ceramics, stone tools and human skeletal remains, it is plausible that LSA communities used the caves and rock shelters in a homogenous way. Hence, this study may support Anderson´s (1997) suggestion that the start of cave and rock shelter inhumations is related to a shift in the socio-economic system, i.e., from hunting and gathering to agriculture. However, no conclusions regarding site uniformity and function during the LSA can be made based on the reconnaissance results alone. Further archaeological data is needed in order to be able to explore possible agricultural transformation processes in the LSA communities.

CONCLUSION

This archaeological reconnaissance has revealed seven caves/rock shelters with direct (surface finds) or indirect (oral testimonial) evidence of LSA artifacts. This shows that the methodology used here, i.e., archaeological reconnaissance combined with community interviews, and inventories of museum collections, is useful as an alternative to conventional archaeological survey strategies. Archaeological information obtained with this method could usually not have been gained through conventional archaeological survey methods alone.

The combination of interviews and inventories of museum collections, can contribute a great deal of knowledge to conventional archaeological surveys, particularly in areas which are archaeologically poorly known. The research methodology used here showed a capacity to guide us to suitable reconnaissance areas and enabled us to identify new archaeological sites. The incorporation of local communities in the methodology also proved to be a good strategy, as it combines archaeological research, cultural heritage management and increased community involvement.

This project is a pilot study and it contributes to the understanding of LSA communities in the area. However, the results from the archaeological reconnaissance are not enough to contribute to the discussion on the agricultural transformation of the area. More detailed surveys and excavations are needed. Bellwood (2007: 261) also proposes that cave and rock shelter burials during the LSA could be associated with a shift to sedentary village communities around riverine locations near the caves. Hence, systematic surveys in the areas around the cave and rock shelter sites could result in the recovery of open air LSA sites.

Further, it stands clear that it is necessary to include local case studies in the larger picture if we want to understand the regional development of agriculture in SEA. Further emphasis on local studies, environmental data and

GIS studies could be used in order to test the validity of the conventional hypothesis of agricultural transformation in the region.

ACKNOWLEDGEMENTS

Sida (Minor Field Studies), Rydbergs fond and African and Comparative Archaeology, Department of Archaeology and Ancient History, Uppsala University, supported the fieldwork financially. The 13th FAD, Songkhla contributed with local knowledge in the field. Thanks to Supot Prommanot, Pornthip Pantukowit and Siriporn Limwijitwong. Gratitude also goes to the museums and local residents. I am thankful to Anneli Ekblom, Marjaana Kohtamäki, Karl-Johan Lindholm and Anna Karlström at Uppsala University. I am also indebted to Paul Sinclair, for his constant support throughout my studies at Uppsala.

REFERENCES

Adi, T. 1983. Recent archaeological discoveries in Peninsular Malaysia (1976-1982). *JMBRAS* 56 (1): 47-63.

Adi, T. 2005. Overview of Archaeological Research in Malaysia. In J. Manavid, and P. Pisnupong (eds), *Proceeding of the seminar Thailand-Malaysia: Malay Peninsula Archaeology Programme:* pp. 43-48. Bangkok: Samaphan Publishing.

Albrech, G., J. Moser, and S, Pookajorn. 1993. *Sakai Cave, Trang Province – Southern Thailand: Preliminary report on the field work 1993*. Tübingen: Institut für Urgeschichte der Universität Tübingen.

Albrech, G., and J. Moser, 1996. *Recent Mani settlements in the Satun Province, southern Thailand. Report on the 1995 & 1996 field campaigns*. Tübingen: Institut für Urgeschichte der Universität Tübingen.

Allen, J. 1990. Agriculture, Hydraulics, and Urbanism at Satingphra. *Asian Perspectives*, 28 (2): 163-214.

Allen, J. 1991. Trade and site distribution in early historic-period Kedah: geoarchaeological, historic, and locational evidence. *Bulletin of the Indo-Pacific Prehistory Association*, 10: 307-319.

Allen, J. 1997. Inland Ankor, coastal Kedah: landscapes, subsistence systems and state development in early Southeast Asia. *Bulletin of the Indo-Pacific Prehistory Association, 16*: 79-87.

Anderson, D. 1988. Excavations of a Pleistocene Rock Shelter in Krabi and the Prehistory of Southern Thailand. In P, Charoenwongsa and B. Bronson (eds). *Prehistoric Studies: The Stone and Metal Ages in Thailand, (Papers in Thai Antiquity 1)*: pp. 43-60. Bangkok: Thai Antiquity Working Group.

Anderson, D. 1990. *Lang Rongrien rockshelter: a Pleistocene–early Holocene archaeological site from Krabi, Southwestern Thailand*. Philadelphia: The University Museum, University of Pennsylvania.

Anderson, D. 1997. Cave Archaeology in Southeast Asia. *Geoarchaeology: an international journal*, 12 (6): 607-638.

Anderson, D. 2005. Late Pleistocene and Early to Middle Holocene Use of Caves in Peninsular Thailand. *Asian Perspectives* 44 (1): 137-153.

Auetrakulvit, P. 2005. The subsistence of Prehistoric Man during Late Pleistocene-Early Holocene in Peninsular Thailand. In J. Manavid, and P. Pisnupong (eds), *Proceeding of the seminar Thailand-Malaysia: Malay Peninsula Archaeology Programme:* pp. 50-62. Bangkok: Samaphan Publishing.

Asawamas, D. 2008. *Petrographic analysis of pottery from Kok Thong, Ranot Amphoe in Songkhla Province and Khao Lamu, Amphoe Khaunkalong in Satun Province*. Bangkok: Fine Arts Department. (In Thai).

Bellwood, P. 1993. Cultural and Biological Differentiation in Peninsular Malaysia: The Last 10,000 years. *Asian Perspectives* 32 (1): 38-60.

Bellwood, P. 2007. *Prehistory of the Indo-Malaysian Archipelago*. 2nd ed. Canberra: ANU E-Press.

Chaimongkol, S. 2005. Prehistorical Cave Arts Studied by the Southern Thailand Archaeological Research Project, In J. Manavid, and P. Pisnupong (eds), *Proceeding of the seminar Thailand-Malaysia: Malay Peninsula Archaeology Programme:* pp. 90-94. Bangkok: Samaphan Publishing.

Charoenpot, S. J. Incherdchai, and R. Kojaranont. 2008. *44 National Museums of Thailand*. Group of Promotion and Public Relations, Fine Arts Department. Bangkok: Rungship Publisher.

Crawford, G.W. 2012. Early rice exploitation in the lower Yangzi valley: What are we missing? *The Holocene* 22 (6): 613-621.

Dheeradilok, P. 1992. An introduction to Geology in Thailand. In (anon.) *National Conference on Geologic Resources of Thailand: Potential for Future Development 17-24 November, 1992*: pp. 37-752. Bangkok: Department of Mineral Resources.

Fine Arts Department. 1986. *Archaeological Study: Chiew Lam Project: By the Bureau of Archaeology*. Bangkok: Fine Arts Department. (In Thai).

Forestry Statistics of Thailand. 2007. *Forest Land Assessment by Province in 2004 – 2006*. Available at: http://www.forest.go.th/stat/stat50/stat2550.htm [accessed 9 October 2009].

Hai, C-H. *et al*. 2007. Pollen and Phytolith Analyses of Ancient Paddy Fields at Choudun , site, the Yangtze River Delta. *Pedosphere* 17 (2): 209-218.

Higham, C.F.W. 1989. *The Archaeology of Mainland Southeast Asia*. Cambridge. Cambridge University Press.

Higham, C.F.W. 1996. Archaeology and Linguistics in Southeast Asia: Implications of the Austric Hypothesis. *Bulletin of the Indo-Pacific Prehistory Association* 14: 110-118.

Higham, C.F.W. 2002. Languages and Farming Dispersals: Austroasiatic Languages and Rice Cultivation. In P. Bellwood and C. Renfrew (eds), *Examining the Farming/Language Dispersal hypothesis*: pp. 223-232. Cambridge: The McDonald Institute.

Higham, C.F.W. 2005. Complex Societies of East and Southeast Asia. In C. Scarre (ed), *The Human Past: World Prehistory and the Development of Human Societies:* pp. 552-593, London: Thames & Hudson.

Higham, C.F.W. and T. Higham. 2009. A New chronological framework for prehistoric Southeast Asia based on a Bayesian model from Ban Non Wat. *Antiquity* 83: 125-144.

Horton, B.P., P. L. Gibbard, G. M. Mine, R. J. Morley, C. Purintavaragul, and J. M. Stargardt. 2005. Holocene sea levels and palaeoenvironments, Malay-Thai Peninsula, Southeast Asia. *The* Holocene 15 (8): 1199-1213.

Karlström, A. 2009. *Preserving impermanence: the creation of heritage in Vientiane, Laos*. Ph. D. dissertation. Uppsala: Uppsala University.

Källén, A. 2004. *And Through Flows the River: archaeology and the pasts of Lao Pako*. Ph. D. dissertation. Uppsala: Uppsala University.

Kealhofer, L. 2002. Changing Perceptions of Risk: The Development of Agro-Ecosystems in Southeast Asia. *American Anthropologist* 104 (1): 178-194.

Kealhofer, L. 2003. Looking into the Gap: Land Use and the Tropical Forests of Southern Thailand. *Asian Perspectives* 42 (1): 72-95.

Limwijitwong, S. 2005. Historic Rock Arts in the South of Thailand. In J. Manavid, and P. Pisnupong (eds), *Proceeding of the seminar Thailand-Malaysia: Malay Peninsula Archaeology Programme:* pp. 95-101. Bangkok: Samaphan Publishing.

Liu, L., G. Ah-Lee, L. Jiang, and J. Zhang. 2007. Evidence for the early beginning (c .9000 cal BP) of rice domestication in China: a response. *The Holocene* 17: 1059-1068.

Matsamura, H., and M. Zuraina. 1999. Metric Analyses of an Early Holocene Human Skeleton from Gua Gunung Runtuh, Malaysia. *American Journal of Physical Anthropology* 109: 327–340.

Mudar, K., and D. Anderson. 2007. New Evidence for Southeast Asian Pleistocene Foraging Economies: Faunal Remains from the early Levels of Lang Rongrien Rockshelter, Krabi, Thailand. *Asian Perspectives* 46 (2): 298-334.

Omakupt, M. 1972. Atlas of Thailand. Major Land Uses. Scale: 2,500,000. Royal Thai Survey Department. Available at: http://eusoils.jrc.ec.europa.eu/esdb_archive/EuDASM/Asia/maps/TH2000_3LU.htm [accessed 17 October 2009].

Panapitukkul, N., A. Pengnoo, C. Siriwong, and W. Chatupote. 2005. Hydrogeomorphological Controls on Groundwater Quality in the Ratthapum Catchment (Songkhla Lake Basin), Thailand: Water, Air, and Soil Pollution. *Focus* 5: 149–163.

Pendleton, R. L. 1949. Provisional Map of the Soils and Surface Rocks of the Kingdom of Thailand. Scale: 2, 500, 000. Bangkok: Cadastral Survey Office. Available at: http://eusoils.jrc.ec.europa.eu/esdb_archive/EuDASM/Asia/maps/TH2003_SO.htm [accessed 17 October 2009].

Pookajorn, S. 1991. *Preliminary 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*. Bangkok: Silpakorn University Press.

Pookajorn, S. 1994. *Final Report of Excavations at Moh Khiew Cave, Krabi Province; Sakai Cave Trang Province and Ethnoarcheological Research of Hunter-Gatherer Group, so called "Sakai" or "Semang" at Trang Province*. Bangkok: Silpakorn University Press.

Pookajorn, S. 1996. Human activities and environmental changes during the Late Pleistocene to Middle Holocene in Southern Thailand and Southeast Asia. In L. G. Straus, B. V. Eriksen, J. M. Erlandson, and D. R. Yesner (eds), *Humans at the End of the Ice Age: The Archaeology of the Pleistocene-Holocene Transition*: pp. 201-214. New York: Plenum Press.

Srisuchat, A. 2005. Overview of Southern Thai-Malay Peninsula Archaeology. In J. Manavid, and P. Pisnupong (eds), *Proceeding of the seminar Thailand-Malaysia: Malay Peninsula Archaeology Programme:* pp. 32-42. Bangkok: Samaphan Publishing.

Stargardt, J. 1973. Southern thai waterways: archaeological evidence on agriculture, shipping and trade in the srivijayan period. *Man* 8 (1): 5-29.

Stargardt, J. 1976. Man's impact on the ancient environment of the Satingpra Peninsula, South Thailand. I. The natural environment and natural change. *Journal of Biogeography* 3 (3): 211-228.

Stargardt, J. 1983. Satingpra I: *The Environmental and Economic Archaeology of South Thailand*. Oxford: British Archaeological Reports (BAR) in association with ISEAS, Singapore.

Stargardt, J. 2003. Mapping the Mind. Some Cultural Cargos of the Sea-Trade in Southeast Asia, 5th – 13th century. In A. Karlström, and A. Källén (eds), *Fishbones and Glittering Emblems*: pp. 103-117. Stockholm: Museum of Far Eastern Antiquities.

Tan, N. H., and S. Chia. 2011 Current Research on Rock Art at Gua Tambun, Perak, Malaysia. Inland. *Bulletin of the Indo-Pacific Prehistory Association* 31: 92-107.

Virgo, K. J., and D. A. Holmes. 1977. Soil and Landform Features of Mountainous Terrain in South Thailand. *Geoderma* 18 (3): 207-225.

Wang, W-M., J-L. Ding, J-W. Shu, and W. Shen. 2010. Exploration of early rice farming in China. *Quaternary International* 227: 22-28.

Zuraina, M., and H. D. Tjia. 1988. Kora Tampan, Perak: the geological and archaeological evidence of a late Pleistocene site. *Journal of the Malayan Branch of the Royal Asiatic Society* 61 (2): 123-134.

Zuraina M. 1994. The excavation of Perak man, an epi-Palaeolithic burial at Gua Gunung Runtuh. In M. Zuraina (ed), *The excavation of Gua Gunung Runtuh and the discovery of the Perak man in Malaysia*: pp. 23-47, ed. M, Zuraina. Kuala Lumpur: Department of Museums and Antiquity, Malaysia.

Zuraina M. 2005. *Perak Man and Other Prehistoric Skeletons of Malaysia*. Penang, Malaysia: University of Science Malaysia.

13th Fine Arts Department. 1986. *Archaeological survey and excavation from Khao Rakian*. Unpublished report. The 13th Fine Arts Department, Songkhla. (In Thai).

13th Fine Arts Department. 2007. *Archaeological survey for mining of Pirapon Mining, Tanbon Khuga Tai*. Unpublished report. The 13th Fine Arts Department, Songkhla. (In Thai).