The Use of Caves in Peninsular Thailand in the Late Pleistocene and Early and Middle Holocene

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MOST OF THE WELL-KNOWN CAVE SITES in mainland Southeast Asia are in Malaysia and Vietnam, where intensive prehistoric archaeological research spans more than a century. Thailand has had an active research program only since the 1960s, but is rapidly approaching the same level of coverage (Heekeren and Knuth 1967). In peninsular Thailand, however, cave research began in earnest only in the 1980s, and still lags behind that of other parts of Southeast Asia.

Caves in peninsular Thailand are prominent features in the landscape that have continued to attract people, not only as shelters and places of curiosity but also as locations for social and religious gatherings. Archaeological remains are to be found in nearly every sizable cave in the region, but we must remember that even at the best of times people likely spent only a small portion of their daily lives there, so a focus exclusively on cave use can only be part of their story. A fuller understanding of cave use must be part of broader studies of land use (Engelhardt and Rogers 1997). Also, to date, less than a dozen cave sites (and even fewer open prehistoric sites) have been archaeologically tested or excavated. Most of these are from the limestone karst regions of a portion of the peninsula, the four contiguous provinces of Phangnga, Krabi, Trang, and Satun, as well as Surat Thani, which drains eastward into the Gulf of Thailand (Fig. 1).

The following discussion focuses on only part of even this limited region: the limestone karst caves in Krabi Province. In this paper I have divided the region into five zones: interior, near coast, shore edge, partly submerged, and submerged. The interior caves are sufficiently distant from the coast to have never been directly influenced by rising or falling sea levels. But caves in the other zones have undergone significant changes in their settings, from interior to mangrove and intertidal, semi-submerged, and fully submerged settings, depending on their elevation relative to sea level at any point in time.

GEOLOGY

Peninsular Thailand, as the rest of the Malay peninsula, has a complex geological history (Bunopas 1982). Folding through crustal pressures from the west and

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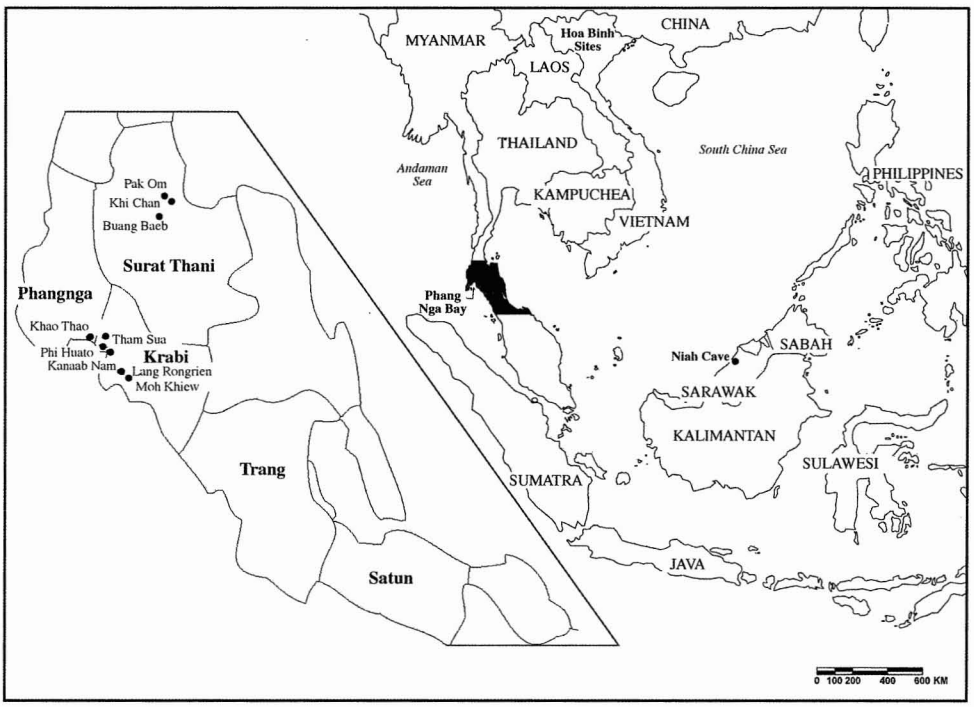

Fig. 1. Map of Southeast Asia, with inset (left) the five southwestern provinces of peninsular Thailand showing locations of archaeological sites mentioned in this paper.

faulting along several northeast-southwest oriented fault zones have resulted in a series of roughly parallel northeast-southwest trending mountain ranges running down the middle of the entire peninsula (Garson et al. 1975). The limestone karst that is scattered throughout the peninsula includes in southwestern Thailand (the Rat Buri formation) isolated towers that protrude through Quaternary alluvial cover in the coastal regions and Tertiary gravels in the near-coast zone, and through sands, oil shales, and lignite of the Krabi formation farther inland (Fig. 2). These towers are riddled with tunnels, fissures, and solution caves, frequently with collapsed walls and roofs that obscure their former sizes and shapes. Most are concentrated along the bases of the mountains, 1–3 m above the surrounding ground level (Fig. 3).

The near-ground-level caves adjacent to rivers or streams, or directly facing the coast, obviously have been formed by flowing water or notched by wave action. But near-ground-level caves situated away from obvious waterways also must have been formed by water action, perhaps as a result of sheet wash or standing water that has periodically accumulated at the base of the karsts. Most of these caves also have a berm across their entrances that was formed by colluvium from higher up the mountain faces. Archaeological materials frequently are embedded in these deposits, some as refuse thrown out by people living or camping inside the caves, and others as in situ occupational debris by people who have camped just outside the cave entrances. Caves situated high above the base of the karsts frequently can be entered only by scaling the vertical faces or by wending one's

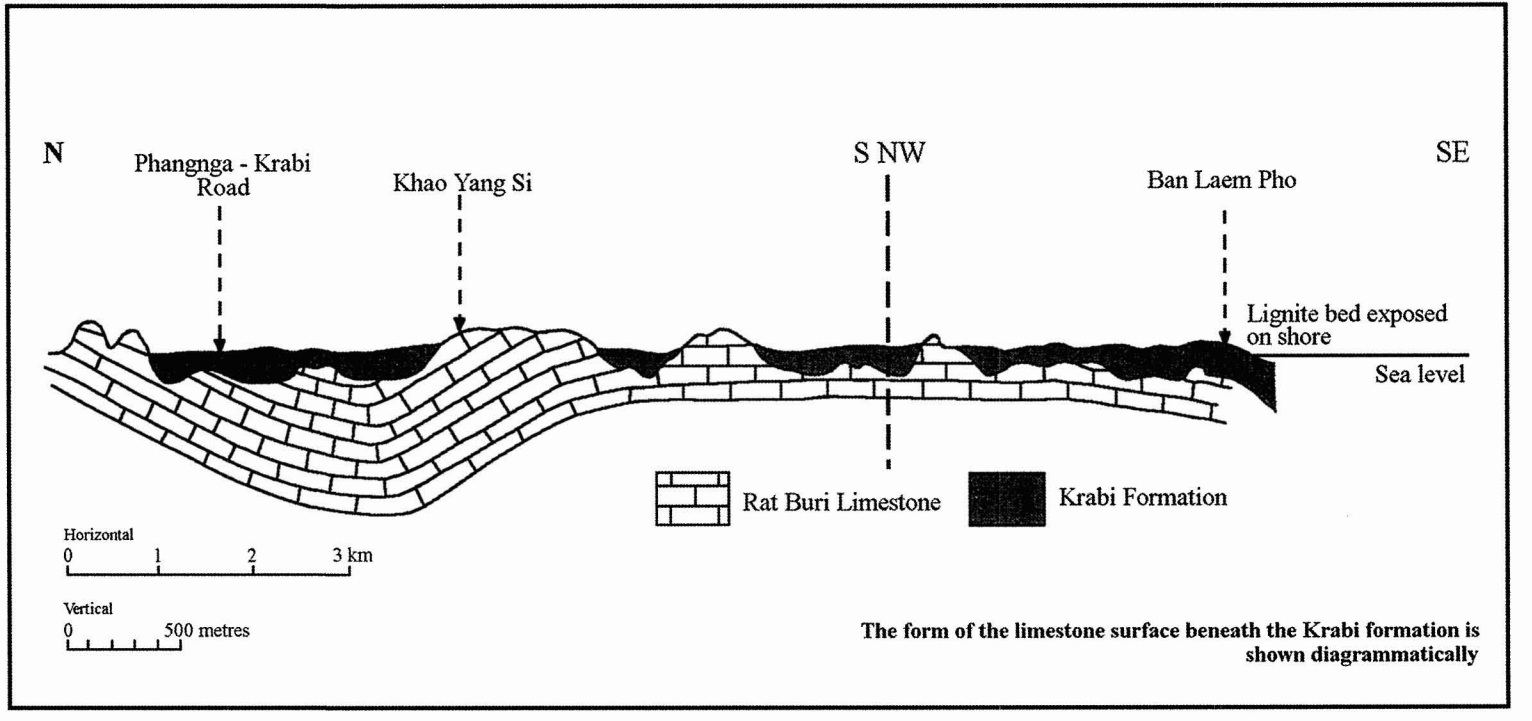

Fig. 2. North-south transect showing the relation between Tertiary Krabi and Permian Rat Buri Formations in Krabi area, peninsular Thailand. (After Garson et al. 1975)

Fig. 3. Near-ground-level caves ringing the base of a tower karst. (Photograph: Douglas Anderson)

way up along narrow ledges. Here, there is usually a sharp break in slope immediately in front of the caves' entrances, which limits the amount of available living space of the potential site.

CAVE USE DURING LATE PLEISTOCENE TIMES

Our understanding of cave use during the late Pleistocene is derived from only two sites, both in Krabi Province. Moh Khiew is a small rock shelter whose earliest levels are apparently older than 25,800 B.P., the radiocarbon date for a burial located at the boundary between the lowest cultural level (Level 1) and Cultural Level 2 (Pookajorn 1996:204). Tham Lang Rongrien has three Pleistocene layers dating from 27,000 B.P. (Stratigraphic Unit 8) to more than 43,000 B.P. (Stratigraphic Unit 10) (Anderson 1997:613). The presence of hearths clearly demonstrates the controlled use of fire, and the tight clustering of lithic artifacts, debitage, and bones around the hearths indicates a camping arrangement whereby people sat around fires while preparing food, eating, and processing implements, but the thinness of the Pleistocene layers and features at Tham Lang Rongrien and the absence of any overlap in the placement of the hearths suggest that the occupations were sporadic and brief. Artifacts include a limited range of flake tools of geyserite, chert, and silicified limestone with well-shaped cutting and scraping edges, and some small core tools with unifacially retouched denticulate cutting edges (Anderson 1990).

The faunal remains at the two sites include several of the same large mammalian species such as cattle, pig, and deer, and bones of an elephant from the 27,000-year-old layer at Tham Lang Rongrien indicate that the Pleistocene peoples were able to hunt even the largest animals of the region. But despite the overlap in species represented, there are also some significant differences between the two sites. At Moh Khiew tree-dwelling animals like langurs, monkeys, and lemurs are in evidence, but apparently no turtles or tortoises, whereas at Tham Lang Rongrien, the Pleistocene levels abound in turtles/tortoises but lack the tree dwellers (Mudar and Anderson n.d.). Whether the differences indicate differences in habitat, which would mean that different time periods are being sampled by the assemblages in these two nearby sites, or whether they indicate variations in hunting patterns, seasonal occupations, or other uses of the same habitat is impossible to say.

The absence of marine or intertidal species in the faunal samples is presumably due to the coastline being much farther from the sites than it is today: given a sea level lowered by more than 70 m, present-day Phangnga Bay would have been entirely dry land, so that the nearest coastline would have been more than 100 km from the sites. This is not to suggest, however, that Pleistocene peoples of peninsular Southeast Asia were not also using coastal resources, since we have both circumstantial and direct evidence of such use from other parts of Asia (Kononenko and Cassidy 2000; Leavesley 2002; Mahirta 2002; Vostretsov et al. 2001; see also this volume: Leavesley), but only that post-Pleistocene seas of the shallow continental shelf off present-day Thailand and Malaysia have submerged such evidence. At times of lower sea level, other cave sites much closer to the then coast were probably used, especially in the numerous tower karsts that presently make up the famed steep-sided islands of Phangnga Bay (Fig. 4). But many of these potential early cave sites are now submerged or partially submerged and thus accessible to underwater archaeological research in the future.

The temporary nature of their occupations indicates that these two sites were not primary living locations. A hint at what such primary locations might look like comes from two excavated Pleistocene open-air sites in northwestern Malaysia (in the Lenggong Valley, Perak): Kota Tampan, dating to ca. 30,000 years B.P. (Zuraina and Tjia 1988), and Bukit Jawa, possibly dating to ca. 50,000 B.P. (Zuraina 1997). Both sites are quarry, workshop, and possibly residential sites located at the edges of fossil lakes. The abundance of stone cores, flakes, debitage, and heavier stone-working tools suggests long-term use of the sites. Unfortunately, the sites lack organic remains or thick midden deposits, perhaps owing to the exposed nature of the locations, so it is difficult to identify the exact nature of living arrangements there. Nevertheless, the site locations suggest they were selected because they combined the presence of raw materials, water, and, likely, the abundance of faunal and floral resources of a lake edge environment.

CAVE USE DURING EARLY HOLOCENE TIMES

The caves of peninsular Southeast Asia were intensively occupied in the early Holocene (ca. 11,000–6500 B.P.), though given the lack of open sites we cannot say whether this represents a region-wide shift in settlement patterning or simply an alternative lifeway practiced by a small portion of the population. Some

Fig. 4. Islands of Phangnga Bay. (Photograph: Douglas Anderson)

particular conclusions about cave use during the early Holocene can be made, however. First, the assemblages conform to what has been characterized as the peninsular Southeast Asian Hoabinhian. Second, the middenlike deposits in the caves tend to be thick, with numerous traces of hearths, stone, and antler artifacts and faunal remains scattered throughout. However, living surfaces are difficult if not impossible to identify, suggesting that the use of caves was sufficiently intensive and continual to preclude the development of microstratigraphic separation between episodes of occupation (Anderson 1990; Pookajorn 1991).

The earliest of the early Holocene occupations is best evidenced at four sites: Tham Lang Rongrien and Moh Khiew in southern Thailand, and the recently excavated sites of Gua Peraling and Gua Chawas in Malaysia (Haji Taha 2000). Hundreds, if not thousands, of flake debitage characterize the deposits, and hundreds of broken bones indicate that people spent considerable time in the caves processing, cooking, and consuming animal products. The thickness of the deposits, evidence of disturbance, variety of artifact types (including hammerstones and grinding slabs, the latter frequently with traces of red ochre), and wealth of fauna all suggest that people were using the caves as places of residence.

The early Holocene was a time of climatic warming and habitat change, although whether the change was from more open to more closed forests or from less varied to more varied forest mosaics is as yet uncertain (Bishop 1994:

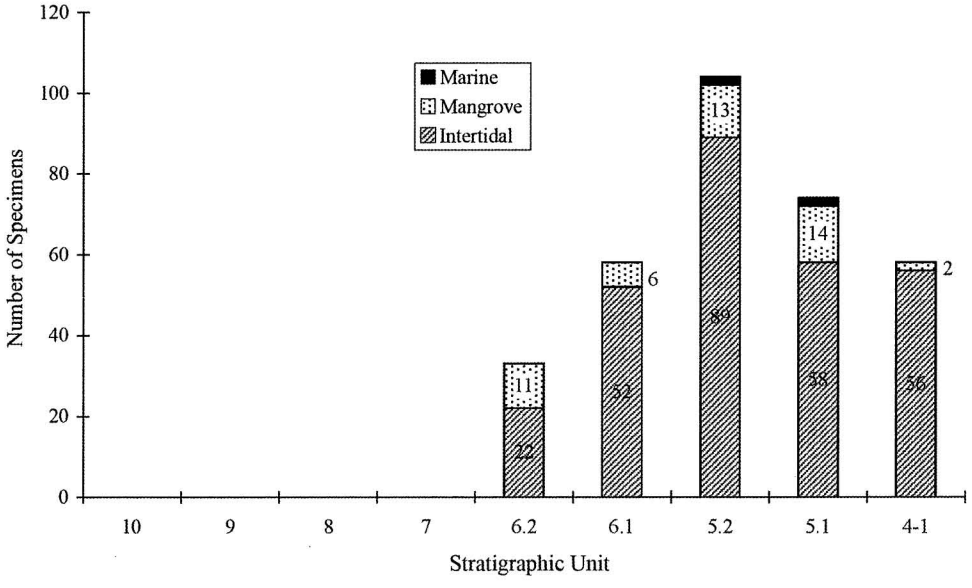

Fig. 5. Tham Lang Rongrien: distribution of marine shellfish by stratigraphic unit.

25; Maloney 1999; Stuijts 1993:119). Foragers in peninsular Thailand continued to hunt the larger mammalian species that were already present in the later Pleistocene, but added many smaller animals to their food base (Haji Taha 2000; Kijngam 1990; Pookajorn 1991). Variation in the faunal assemblages between sites suggests variability in hunting practices, seasonality in cave use, and perhaps food preferences—at Tham Lang Rongrien, for example, tree-dwelling primates are rare, despite their current abundance, but are numerous at other early Holocene sites. Also at Tham Lang Rongrien, we now find evidence of saltwater shellfish in the deposits, something likely associated with the fact that sea level was rising at this time. Shellfish use increased until sometime after 7500 B.P., and then declined until between 4000 and 2500 B.P. (Fig. 5).

CAVE USE DURING MIDDLE HOLOCENE TIMES

Evidence from the shores around Phangnga Bay suggests that sea levels peaked ca. 6000–5000 B.P., the period of mid Holocene sea level maximum (Sinsakul 1990; Sinsakul et al. 1985; Songtham et al. 2000). As sea level rose, caves of the near-coast zone changed from use as interior sites to use as near-mangrove and intertidal locations, and then to use as shore edge sites. As sea level reached its maximum a portion of those sites would have become submerged (Fig. 6). Then, as it retreated, the submerged caves again would have been available as shore edge, then as near-mangrove and intertidal, and eventually again as near-coast interior sites. Currently, nearly a dozen caves from the near-coast and shore edge zones in Krabi are at an elevation that makes them eligible for this scenario of cave use succession, but we have yet to locate any site that underwent the entirety of this process. With the rise of 3 m shortly after 6000 B.P. postulated by Sinsakul (1992),

Fig. 6. A partially submerged cave, Phangnga Bay. (Photograph: Douglas Anderson)

more than two dozen sites now in the coastal zone could have undergone the entire sequence of use and disuse, whereas with the rise of less than 1 m suggested by other researchers, fewer than a half-dozen potential cave sites would qualify for our model. At present, I accept the Sinsakul curve, while recognizing that at least some of the sea level rise around Phangnga Bay could have been due to local tectonic activity (Mazlan bin H. Madon and Kamaludin bin Hassan 1994).

Archaeological surveys have documented more than 50 cave sites in peninsular Thailand from which surface collections have been made. Most of these collections, however, are rejects from recent diggings by local farmers more interested in the organic-rich soils than artifacts, and are thus of limited analytical value. Nevertheless, gross associations of certain artifact types and other cultural material have provided some tantalizing clues about the mid Holocene cultural history of the region (Srisuchat 1987, 1997). More importantly, however, several caves have been sufficiently tested or excavated to yield good evidence as to the nature of their particular use.

Residential Locations and Temporary Campsites

Several sites can be characterized as residential sites on the basis of their deposits (Charoenwongsa et al. 1989).

Tham Khao Khi Chan, situated ca. 45–50 m above a valley floor and 70 m above mean sea level, was characterized by thick artifact-bearing layers that date from earlier than 6060 B.P. to 4250 B.P. (Srisuchat and Srisuchat 1992). The deposit, an admixture of habitation layers with convoluted stratigraphy (Reynolds

1989:36), and the variety of artifacts within it suggest residential occupation as opposed to a series of temporary campsites. Buang Bap, also located in Surat Thani Province, is a complex of three cave sites believed to date to between 5000 and 6000 B.P. (Srisuchat and Srisuchat 1992). Faunal remains include large mammalian species such as buffalo, pig, and deer; smaller mammals such as squirrel; birds such as pheasants; soft-shell turtles; and crab. Marine shellfish such as *Olivela* and *Cypraea* were also present. Here too, the wealth of faunal remains and a wide variety of lithic artifact types suggest a residential site, not a simple camping site. Further, the site is presently situated 126 m from a canal, with the intervening land now an agricultural field. Apparently, the three caves were all facing a heavily vegetated river-edge habitat at the time of occupation. The caves yielded some human bones, flaked and polished stone implements, and a wide variety of pot sherds, including tripod pots, pedestal pots, and cord-marked cups and bowls. Given the presence of three different caves, it is unclear, however, if all pottery types were found directly associated with each other, but the variety of artifacts suggests that multiple components of different ages are represented in the caves.

Pak Om contained chipped stone implements, polished adze blades, and sherds, including those from tripods, associated with thick deposits of habitation debris, and a few human remains. Unfortunately, two dates from the same layer are 6000 years apart (9350 $\pm$ 160 B.P. and 3010 $\pm$ 190 B.P.), so it is impossible to date the occupation or occupations more precisely, although the excavators suggest a date contemporaneous with Buang Baeb (Srisuchat 1997). Khao Tau (Phangnga) is a series of seven caves with numerous flake tools and sherds. The largest, Site 5, was deeply stratified with materials that suggest prolonged residence. This cave contained a burial with associated cord-marked cups that has been dated to ca. 5250 B.P. (Srisuchat and Srisuchat 1992).

Tham Sua is only one of two prehistoric shell middens yet reported from the Krabi-Phangnga area. It is characterized by a >1-m-thick deposit of shellfish, primarily cockles and other marine bivalves, with cord-marked sherds and stone flakes scattered throughout the deposit. A sample of shell from below the lowest sherd yielded a date of 6440 $\pm$ 100 B.P. (GX-25018). The sherds are nondescript, except that none is obviously from a tripod pot. Tham Sua was found in a road cut near Ao Luk, buried under 1 m of sterile deposit. Its presence would have been undetected were it not for the road construction, which suggests that other similar sites may be present in the region. The site was obviously a long-term residential area that at one time must have been dozens of square meters in extent. It lay at the base of a steep-sided tower karst directly facing a mangrove forest and inlet that were obviously the source of the faunal remains from the site (Fig. 7).

In sum, many mid Holocene caves in peninsular Thailand were used as residential sites, in which considerable occupational debris accumulated. Many if not most of these sites are situated near waterways that lead to Phangnga Bay, and most are adjacent to mangrove forests and overlook the coastal plain in the near-coast zone 2–3 m above sea level. It appears that people who used the mangrove areas of the coastal zone actually selected areas that were backed by caves for settlement. Temporary campsites are rare in the coastal zone, possibly because the resources included shellfish, whose locations were sufficiently predictable to allow for a more sedentary lifestyle.

Fig. 7. Tham Sua shell midden near Ao Luk. (Photograph: Douglas Anderson)

Cemeteries

A third type of cave use was as a cemetery, defined here as a series of multiple interments that appear to have been laid out according to some general plan or from a sense that the site was a special place to bury the dead. The implication is that the burials were made by people who were aware of the location of previous burials there and who may well have been members of the same community. Cemeteries differ from the single burials that are occasionally found in caves used for occupation in that the latter appear to be more ad hoc, in the sense that people did not return later to the site to inter more individuals.

The major example of a cemetery cave is the upper stratigraphic unit at Tham Lang Rongrien, which contained more than 20 graves (Anderson 1990). The skeletons were extended and lying on their backs, some in log-lined coffins but others simply in unlined pits. The deposits associated with the burials lacked evidence of occupation, suggesting that, while the site was used as a burial ground, people avoided it for everyday purposes, in sharp contrast to coastal caves. A feature of the burials is the abundance of grave goods, especially pottery, commonly either an assemblage of pedestal pots or an assemblage of black or gray cord-marked cups and round-bottomed cooking pots. The former seem to have been made expressly for burials, whereas the latter are also found in nonburial contexts.

The Tham Lang Rongrien cemetery is comparable to several in Malaysian caves, for example Gua Cha (Haji Taha 1985, 1991) and Gol Bait (Callenfels and Noone 1940), but whereas the former was used only as a cemetery, Malaysian archaeologists have nearly unanimously concluded that the Malaysian caves were used continuously as burial and as dwelling sites throughout the early and mid

Holocene. Malaysian caves with or without burials contain lithic debitage and tool types (described as Hoabinhian) in the same stratigraphic contexts as Neolithic pottery types and polished adze blades that at Tham Lang Rongrien were exclusively from burials. To explain the wealth of pottery, it has been suggested that caves were sacred places where rituals were carried out, sometimes accompanying burials but at other times for other purposes (Tweedie 1953).[1]

The cultural and temporal relation between pottery types, especially pedestal and tripod pots, has yet to be worked out. Certainly their association at Ban Kao (Sørensen 1967) does not occur on the peninsula. Many tripod pots appear in nonburial contexts, suggesting that we are dealing with at least two different traditions of pottery manufacture and use. In coming to the same conclusion, Heng (1990) has associated the tripod pot assemblages with agriculturalists and ancestors of the Mon-Khmer peoples of mainland Southeast Asia. While I would not go so far as to assign ethnicity, Heng's suggestion that the pots are associated with early agriculturalists is intriguing given the river-edge settings of residential sites like Buang Baep, though the presence of tripod pots also at coastal sites suggests that other types of sedentary peoples may have been using them.

Industrial Sites

Industrial sites are identified on the basis of a preponderance of cultural materials in various stages of manufacture, but a lack of residential refuse. Na Ching is situated on a 10-m-high rock ledge overlooking a sheer face of a small tower karst that in turn overlooks a small, gently rolling valley floor. It was clearly a special-purpose site devoted to adze making: the principal artifacts present were adze blades of nonlocal stone in various stages of manufacture, from blanks to preforms to finished products. Sherds of numerous tripod pots lay scattered throughout the deposit, associated with charcoal from hearths, sparse faunal remains, and the adze-manufacturing debris. Khao Kanaab Nam (Anderson and Anderson 2000) is a rock shelter situated about 1 m above the high-tide level in the estuary of the Krabi River (Fig. 8). The primary occupation layer contained stone flakes and cores of almost exclusively a glassy honey-colored geyserite apparently derived from around hot springs located 30–40 km south of the site. Of the hundreds of cores and various-sized flakes, only a tiny portion has any trace of use. Again, it is apparent that the materials are the by-products of adze manufacturing. There were also faunal remains at the site, but no mollusks or other habitation debris such as hammerstones or grinding slabs; presumably the residential location of the occupants was elsewhere. There were a few cord-marked sherds, including fragments of a tripod pot and a shallow bowl; adjacent charcoal fragments yielded an AMS date of 4410 $\pm$ 50 B.P. (GX-26109), which if truly associated yields an especially early date for tripod pots in the entire region.

Painted Caves

A fifth use of caves apparently attributable to the middle Holocene was as a setting for cave paintings. We say "apparently" because we have so little real evidence as to age. Clearly, many of the cave paintings date to the historic period, since seventeenth- through nineteenth-century European ships are occasionally

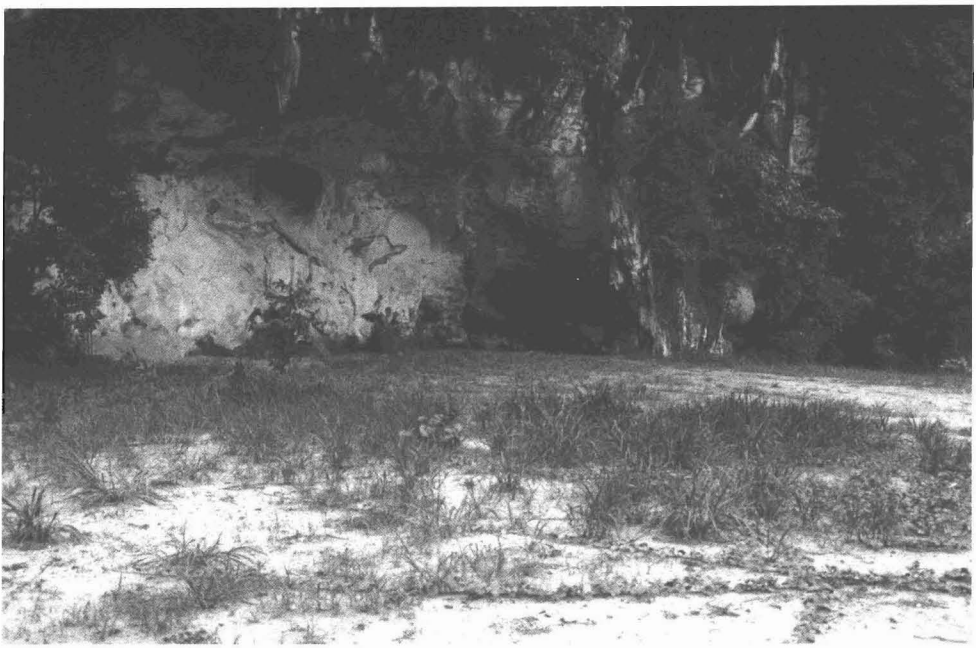

Fig. 8. Khao Kanaab Nam. (Photograph. Douglas Anderson)

depicted (Sangwan 1987). Others, such as Tham Phi Huato near Ao Luk (Anderson and Suchitta 1979, 1983), appear to be much older (Fig. 9). A content analysis of the earlier paintings suggests that at least some of the paintings were related to ritual, whereas others are realistic depictions of fish and birds. The human figures are sketchy and in positions that may or may not be interpreted as ritualistic.

In peninsular Thailand cave paintings are largely confined to shore-edge and partially submerged caves, both on the mainland and on islands, whereas in Malaysia and also throughout continental Southeast Asia most are found in the interior regions. The rarity of cave paintings in the interior of peninsular Thailand is probably a sampling problem. The painted caves frequently include cultural deposits as well, including sherds, shellfish remains, and animal bones. Given the limited usable floor space in most of these caves and the fact that they are away from freshwater sources, the cultural debris suggests use as temporary campsites (Sangwan 1987:127). The campsites might have been scenes of ritual activity associated with the paintings.

CONCLUSION

As this paper has shown, caves have been used extensively throughout peninsular Thailand from late Pleistocene times to the historic era. Their uses have varied and changed over the millennia, most likely in response to changes in overall economic activities, settlement patterns, and religious beliefs. Clearly, though, we have yet to recognize many of the important cultural factors that people considered in selecting particular cave sites. To achieve this goal, we must embed our

Fig. 9. Tham Phi Huato: cave painting. (Photograph: Douglas Anderson)

future studies of cave use within the framework of the total history of land use in the region.

NOTE

1. The earliest dates for pottery in Malaysian caves are ca. 4800 B.P. (Dunn 1966; Peacock 1959). In peninsular Thailand, two pottery-bearing sites in the near-coast regions of Krabi date to 6400

B.P. (Tham Sua) and 4400 B.P. (Khao Kanaab Nam), and the earliest pottery-bearing cave sites from Surat Thani are from ca. 6000–5000 B.P. In central and northern Thailand, pottery appeared between 4400 and 3700 B.P. (Glover 1990; Higham 1989, 2002; Higham and Bannanurag 1990; Higham and Thosarat 1993; Sørensen 1967; Pookajorn 1984), though there is a remote possibility that it was present by 7600 B.P. (Gorman 1972). Farther east, in Vietnam, pottery was present by 7000 B.P. (Ha Van Tan 1988) and in Cambodia by 6400 B.P. (Mourer 1977). The dates quoted here are uncalibrated.

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ABSTRACT

Caves in peninsular Thailand have a complex history of human use ranging from brief campsites to long-term occupation and from locations of industrial activity to landscapes inhabited by spirit forces. In late Pleistocene times, dating from before than 40,000 B.P. to about 11,000 B.P., caves were used only sporadically as temporary campsites, where people built fires, fashioned tools, and consumed the meals of animal (and presumably plant) products. During early Holocene times, dating from before 11,000 B.P. to about 6500 B.P., many caves were occupied for sufficient duration to have built up sizable midden deposits, occasionally over 1 m thick. Some of these deposits also include burials, usually of single randomly placed individuals with few, if any, grave goods. During mid Holocene times, ca. 6500–3500 B.P., some caves were used as burial grounds, with little if any trace of occupation, whereas others were scenes of domestic activity. Mid Holocene and recent times also saw the use of cave walls as media for paintings, with depictions, often crude, of whole or parts of human figures, fish, birds, and land animals. KEYWORDS: prehistory, Southeast Asia, late Pleistocene, early Holocene, mid Holocene, caves.