

RETHINKING THE DEVELOPMENT OF SEDENTARY VILLAGES IN WESTERN THAILAND

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INTRODUCTION

Over the past several decades, archaeologists in Southeast Asia have focused on the issues of the origins of agriculture and the transition from hunting-gathering to food production (e.g., Gorman 1971; Higham 1984; Bellwood 1993). It is generally assumed that there is a close relationship between stages of agricultural development and social complexity. For instance, according to Bellwood:

...a world-wide perspective on the archaeological record which pertains to the origins of agriculture indicates that cereals (rather than tubers and fruits) were the major food resources behind the earliest developments of sedentary village-based lifestyles and the resulting cultural changes toward complex societies (1985:206).

Although the traditional European chronological framework has been criticized because it fails to recognize the range of variability in the archaeological record through time and space (Hutterer 1976, 1977), the term "Neolithic" is still widely used to represent this stage of cultural development. In Southeast Asian archaeology the label "Neolithic" is commonly associated with sedentism.

This paper attempts, first, to provide a background covering archaeological research on the "Neolithic" and current knowledge of the development of the "sedentary village" in Thailand. In particular, I focus attention on the complexity of the archaeological evidence, using data from western Thailand. I limit myself to Kanchanaburi province, in particular the valleys of the Lower Khwae Noi, Lam Phachi (a Khwae Noi tributary), Lower Khwae Yai and Lam Taphoen (a Khwae Yai tributary) rivers. At the same time, I briefly discuss data from other areas in

order to bring the local context into a broader regional context. The second goal of this paper is to provide an overview of the complexities of the issue of "sedentism" from a cross-cultural perspective. I focus on the concept of sedentism in current anthropological archaeology. Understanding the nature of sedentary adaptations helps the understanding of variability in the archaeological record. Third, I focus attention on some general assumptions regarding associations between subsistence economy and sedentism that have been made and need to be reexamined.

THE ENVIRONMENTAL SETTING

Climatically, Kanchanaburi has a tropical monsoon climate, with a clear pattern of wet and dry seasons. The topography is undulating and the region has relatively discrete boundaries. Three major environmental zones are present: mountains, piedmont and alluvial plains. The western border of the province is bounded by limestone and sandstone mountains with agricultural plantations in the foothills. The mountain slopes are generally covered with a mixed deciduous forest and various bamboo species are common. The limestone mountains contain a number of caves and rock shelters. The piedmont zone lies between the mountains and the valley floors and is an area of plantation agriculture of crops such as sugarcane and manioc. Finally, the alluvial zone is situated along the main rivers—the Khwae Noi and Khwae Yai and their respective tributaries the Lam Phachi and Lam Taphoen. The alluvial zone supports most of the agriculture. In the last two decades numerous archaeological sites in Kanchanaburi have been rapidly destroyed through land development.

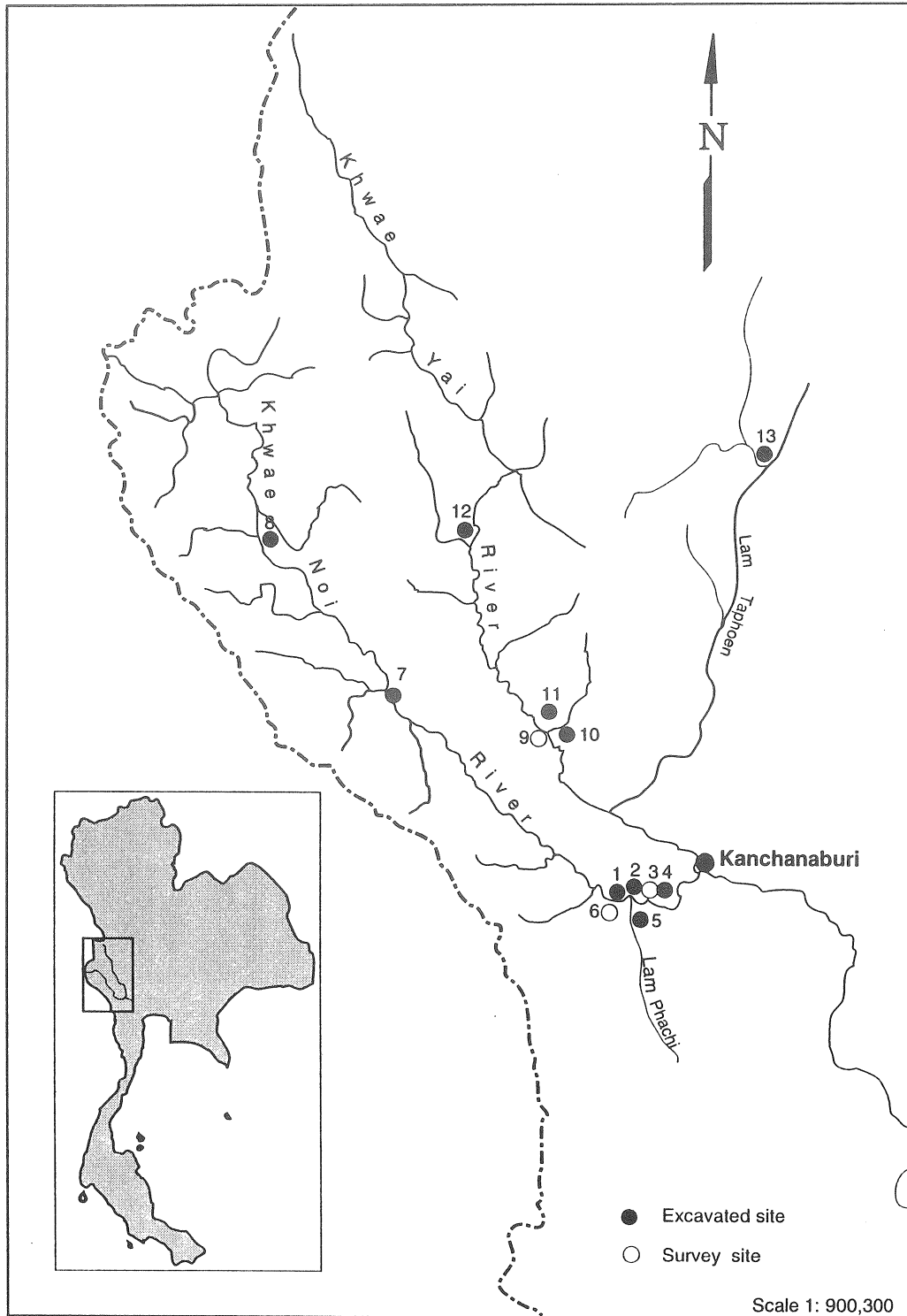


Figure 1: Location of "Neolithic" sites in Kanchanaburi province, western Thailand mentioned in the text. 1) Ban Kao, 2) Talu and Heap caves, 3) Sane cave, 4) Lang Kamnan cave, 5) Rai Arnon, 6) Kao cave, 7) Sai Yok cave, 8) Chande cave, 9) Kang Chine, 10) Han Songchram, 11) Khao Sam Liam cave, 12) Ongbah cave and 13) Don Noi

CULTURAL CHRONOLOGY

Prior to the 1960s there was no chronological framework for Thai prehistory. In 1960-1962 the Bang and Lue sites in Ban Kao hamlet, Kanchanaburi province (Figure 1), were discovered and excavated by the Thai-Danish Expedition (Sørensen and Hatting 1967; You-Di 1986). Sørensen applied the term "Neolithic" from the European tradition to the Ban Kao materials. Since then the term "Ban Kao culture" has been taken to represent the "Neolithic" period of the region and western Thailand as a whole. Sørensen defined a "culture" as a series of assemblages of types, in this case including tripod and black burnished pottery and specific mortuary practices (extended burial with grave goods at the head and feet). A rudimentary local chronology was established based on artifact typology and absolute dating, but no stratigraphic information was incorporated. According to Sørensen (Sørensen and Hatting 1967: 135-136) the cultural chronology could be divided into three phases: a Neolithic early subphase, a Neolithic late subphase and an Iron age phase.

However, there is a major controversy concerning the date for the appearance of iron implements at the Bang site which complicates the dating of these three phases (Parker 1968; Solheim 1969; Bayard and Parker 1976; Macdonald 1978). Radiometric dates from the Bang site indicate that the "Neolithic Phases" should be dated between 1300 and 1770 BC (Sørensen and Hatting 1967; Tauber 1973:109-110). Additional dates from Khao Talu in Kanchanaburi (Pookajorn 1984a), Khao Khi Chan, Tham Buang Baep in Southern Thailand (Fine Arts Department 1986; Srisuchat 1987) and Jenderam Hilir in Malaysia (Leong 1991), all of which share diagnostic artifacts (e.g., pottery) with Ban Kao, confirm that Ban Kao itself was possibly occupied during the second millennium BC. There are no available dates from the Bang and Lue sites for the "Iron age". Recently, Glover has suggested that the iron artifacts should be dated to the mid-first millennium BC, in which case they would be contemporaneous with those from Ban Don Tha Phet and Tam Ongbah (Glover 1991:353).

As far as the chronological framework is concerned, western Thailand prehistory is still faced with a problem because only a handful of sites have been radiometrically dated (Sørensen and Hatting 1967; Srisuchat 1987; Pookajorn 1984a; Romson 1988; Sørensen 1988). Both local and regional chronologies have been primarily constructed relative to the absolute dating of the Ban Kao site. Here, I will limit myself to the chronology based on the available radiocarbon dates and will leave aside the

problem of the technological features that are often used as markers for stages of cultural development (e.g., Bronze Age, Iron Age). In other words, the available evidence cannot be placed into the three age system of the traditional chronological framework, since it is clear that the Ban Kao site was partially contemporaneous with the polished stone-using site of Khok Phanom Di (e.g., Higham 1989; Higham and Thosarat 1994), the metal workshop sites in Lopburi province (e.g., Natapintu 1988, 1991; Pigott and Natapintu 1988; Pigott *et al.* 1992) and the metal-using sites in northeast Thailand (e.g., Bayard 1984; Higham and Kijngam 1984; White 1982; Wilen 1989). Thus, at present, it is reasonable to say that populations with different scales of organization and forms of subsistence economies co-existed during the second millennium BC.

THE DISTRIBUTION OF MATERIAL CULTURE

Although I am aware of the dating problems (i.e., that it cannot be assumed that the chronological sequence at the Ban Kao site will be fully represented at other sites), for the sake of brevity and convenience I will use "Ban Kao" chronology and diagnostic assemblages in a general sense to organize the body of archaeological data into a larger picture. It is important to note that throughout this paper the term "Neolithic" is used in a strict sense. It is defined by typology and should *not* be related to the appearance of agriculture. Following Sørensen, tripod pottery, black burnished pottery and polished stone adzes are treated as diagnostic materials representing the "Neolithic" period of Thailand and Malaysia (Figure 2) (Bellwood 1978, 1985; Fine Arts Department 1987; Srisuchat 1987; Pookajorn 1984a, 1991; Higham 1989; Anderson 1990; Leong 1990, 1991; Shoocongdej 1991a).

Based on the available evidence, in western Thailand sites we generally find polished adzes with cross-sections of lenticular, rectangular, trapezoid and triangular shapes. The stone inventory also includes shouldered adzes, resharphening stones, grinding stones, stone beads, discs and bracelets, and bark-cloth beaters. There are also bone tools, bone and shell beads, tripod pots with conical legs (most legs are burnished, plain or cord-marked), and black burnished and brown wares in various shapes (e.g., pedestalled and stemmed bowls, pedestalled vessels, funnel-necked jars, carinated bowls, cups, round-bottomed bowls and beakers) (Sørensen and Hatting 1967; Supha van and Sangvichien 1978; Fine Arts Department 1987; Kanchanaburi Cultural Center 1988; Sørensen 1988). Southern Thailand and Malaysia share similar but slightly different assemblages in terms of raw materials

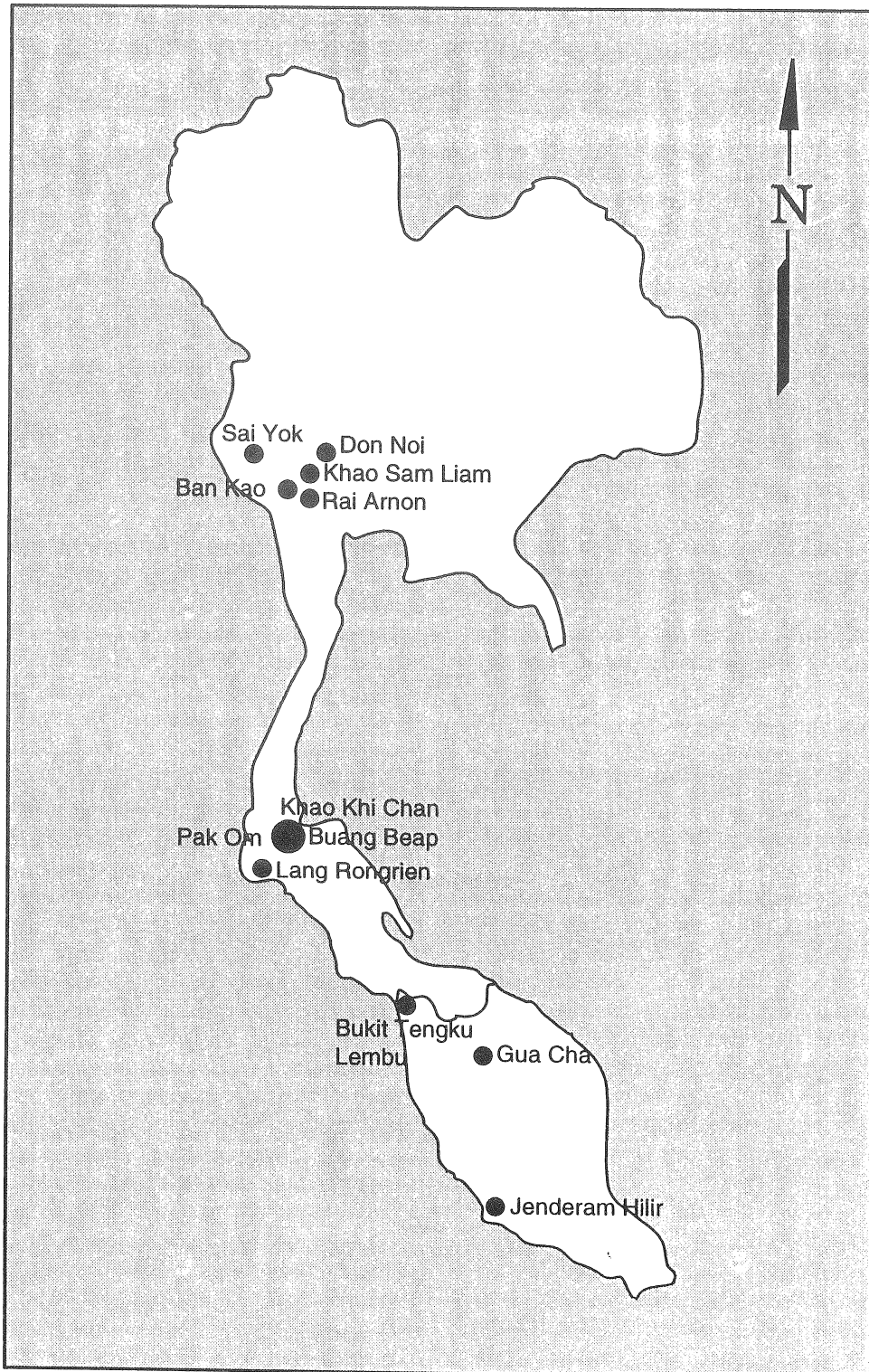


Figure 2: Map of "Neolithic" sites in Thailand and Malaysia mentioned in the text

and pottery and polished stone typologies. Similarities occur in the tripods with hollow legs, carinated bowls with cord-marked decoration, pedestalled bowls, round-bottomed bowls with cord-marked decoration, long adzes, beaked adzes, shouldered adzes, grinding stones, bark-cloth beaters, shell bracelets, and shell beads (e.g., Peacock 1964; Bellwood 1978; Srisuchat 1987; Anderson 1990; Leong 1990, 1991; Pookajorn 1991). Chemical analysis of pottery from western Thailand (Pookajorn 1984b) and X-ray fluorescence analysis of pottery from Malaysia (Leong 1990) indicate that they were made from local clay sources.

Geographically, the sites from these three areas are often found in the alluvial zone, particularly on the second terrace (e.g., Deangiet 1978; Fine Arts Department 1986; 1987; Kanchanaburi Cultural Center 1988; Leong 1990, 1991), in the piedmont zone (Fine Arts Department 1988; Shoocongdej 1991a, 1991b) and in the limestone mountains (e.g., Adi 1985; Fine Arts Department 1986, 1987; Srisuchat 1987; Anderson 1990; Pookajorn 1991, 1994). It is interesting to note that the distribution of tripod pottery is primarily limited to the western and southern part of Thailand and the western part of Malaysia. The southern Thailand and Malaysian sites are mostly burial caves, and the "Neolithic" assemblages often lie stratigraphically above the "Hoabinhian" layers (e.g. Sieveking 1954; Adi 1985; Fine Arts Department 1986; Anderson 1990, Pookajorn 1994). Habitation sites in the alluvial lowlands are also reported (e.g., Leong 1990). In western Thailand, however, especially in Kanchanaburi province, the burial sites are located in three environmental zones. In particular, some caves were used purely as cemetery sites (e.g., Khao Sam Liam cave, Sane cave) whereas others functioned as temporary camp sites and have "mixed" assemblages in the upper layers (e.g., Lang Kamnan cave, Khao Talu). Clearly, the archeological evidence shows regional homogeneity of the "Ban Kao" culture with some degree of local variation represented in sites from western Thailand through to Malaysia.

THE NATURE OF THE EVIDENCE IN WESTERN THAILAND

This review of data is based on scattered published reports from surface surveys and excavations by Thai and foreign archaeologists over the last three decades. Much of what we know of site location and distribution of "Neolithic" sites comes from surveys and excavations conducted by the Thai Fine Arts Department (e.g., Fine Arts Department 1987, 1988) and the Thai-Danish Expedition (van Heekeren and Knuth 1967; Sørensen and

Hatting 1967; Sørensen 1988). More data from sites in various environmental zones are now available (Figure 1). Besides the Ban Kao site, research by Thai archaeologists is relatively unknown to western archaeologists since most of the reports are in Thai which very few western scholars can read. Hence, a brief description of artifacts from a number of sites provides us with a general idea of assemblage diversity in the region, and their similarities and differences from Ban Kao. Recently, Surapol Natapintu (1987) suggested that there were three cultural groups that separately occupied the Khwae Noi, Khwae Yai and Lam Taphoen valleys. He based this view on regional differences in the archaeological evidence from these areas. From empirical data, clearly, it is difficult to follow the conventional interpretation of the "Neolithic" period and we must carefully examine the available evidence in the region.

It is also necessary to point out that the majority of sites lack absolute dates and dating tends to rely on comparing artifact types with Ban Kao. Moreover, many of the known open-air and cave sites with "mixed" assemblages of "Neolithic" and "Metal Age" types (Fine Arts Department 1991) or "Hoabinhian" and "Neolithic" types (Pookajorn 1984a; Sørensen 1988; Shoocongdej 1991a) are surface scatters that cannot be dated by absolute methods. In some cases, such "mixed" assemblages are also found in excavations; unfortunately, no radiocarbon dates are given (Sørensen and Hatting 1967; van Heekeren and Knuth 1967; Pookajorn 1984a; Shoocongdej 1991a).

Along the Khwae Noi river, sites are commonly found in the limestone mountains, piedmont and alluvial zones. Most of them are burial sites (Sørensen and Hatting 1967; Pookajorn 1984a; Sørensen 1988; Fine Arts Department 1988; Shoocongdej 1991a). The sites of Bang and Lue in Ban Kao hamlet have already been mentioned. These were identified as burial and habitation sites by Sørensen, but Macdonald (1978) believed that they were not cemeteries, but only habitation sites. In Sai Yok cave, pottery types associated with burial contexts have been dated to the early and late subphases at the Bang site. Chande cave, also excavated by the Thai-Danish Expedition, had a "Hoabinhian" assemblage preceded by the "Neolithic" layer. The latter comprised polished stone adzes and axes, a piece of conical yellow-white chert, a stone ring, a black carinated bowl, a hemispherical bowl, a large globular pot and a small pot associated with a skeleton (Sørensen 1988:62-65). Also, a number of cord-marked sherds, a fragment of a tripod leg and a rough-out of a stone adze with rice chaff on the

surface were found in a looter's pit in Kao cave (Shoocongdej 1991a). A few cave sites are reported to have small numbers of sherds scattered on their surfaces; these sherds are assumed to be similar to the Ban Kao types (Pookajorn 1984a; Shoocongdej 1991a).

Along the terrace of the Khwae Yai river, tripod pottery has been found at Kang Chine, an alluvial site, while black burnished pottery and other "Ban Kao" pottery types have been found in Khao Sam Liam (Subhavan and Sangvichien 1978) and Ongbah caves (Sørensen 1988). Khao Sam Liam cave was excavated by Sangvichien and Subhavan; unfortunately, the authors report only the ceramic assemblage. A typological study of the pottery was conducted by comparing it with Ban Kao types. Sixteen groups are identical to Ban Kao types such as fruit stands, pedestalled and stemmed bowls, ring-footed bowls, and carinated black and red wares. They relate to the late subphase of the Bang site. A few Khao Sam Liam pottery types have different shapes from the Ban Kao types. At Tam Ongbah cave, polished stone adzes, fragments of polished stone and a vessel of Ban Kao late subphase type were found. Sørensen notes that a number of the sherds from Tam Ongbah belong to the Ban Kao culture also, but they are generally too uncharacteristic for determination with certainty, also because the pottery accompanying the Iron age burial in Ongbah is insufficiently known (1988: 27).

The site of Rai Arnon was surveyed and excavated by the author in 1989 and 1990. It is located on a terrace of the Lam Phachi river. The site functioned as a habitation and a cemetery. One burial was found. Mortuary practice is similar to Ban Kao in that pots were placed at the feet, while polished stone adzes were located at the head. Many polished stone adze fragments and black and orange sherds were discovered. Among the artifacts, sandstone resharpening tools, stone bracelets, shouldered adzes and stone discs were found. The polished stone adzes were made of jasper, silicified mudstone, white chert, and slate shale. Preliminary lithic analysis suggests that the white chert and jasper were not local raw materials and might have been brought from the Lam Taphoen area (Shoocongdej 1991a, 1991b).

The site of Don Noi is situated in the Lam Taphoen valley. The assemblage was previously interpreted as a flaked tool industry of the middle Holocene by Bronson and Natapintu (1988). Recently, the site was excavated by the Fine Arts Department in 1991. The excavators interpreted the site as a polished stone and bracelet workshop as well as a habitation site (Fine Arts Department 1991). Large quantities of lithic debris, fragments of various stages of polished stone manufacture, potsherds,

iron slag and large animal bones are scattered on the site. Raw materials of jasper and white chert were identified. Not too far from the site, raw material sources and workshops were found in the foothills of Khao Chuang Insi (Intrakosai and van Liere 1979; Shoocongdej 1991a). One burial was also reported from Don Noi.

It is interesting to note also that in the second layer above the "Neolithic" layer in Don Noi, a large amount of iron slag was associated with brown earthenware sherds, although there was no evidence of finished iron implements. Furthermore, no evidence of tripod pottery and black burnished pottery was found. Besides Don Noi, another burial site is located at Han Songchram on the second terrace of the Lam Taphoen river (Kanchanaburi Cultural Center 1988). Two skeletons were found here associated with shell ornaments, bone tools, large polished stone adzes, and pottery similar to Ban Kao. The skeletons were buried together and one individual was laid next to the other person's legs.

In sum, there are three different types of site in western and southern Thailand and Malaysia: habitations, cemeteries and lithic workshops. The majority of the sites seem to be burial sites, which commonly are found in caves and on the second terraces of the major rivers. No systematic analyses have been conducted in order to compare whole assemblages from various sites in the area, but variations can be roughly recognized in the settlement patterns, pottery typologies and the varying densities of artifacts. Domesticated cereals have not yet been discovered from these sites, with the exception of Khok Phanom Di, a contemporaneous coastal site where evidence of rice has been found (Higham and Maloney 1989; Higham and Thosarat 1994; Thompson 1992). (Because I limit myself only to the western region of Thailand I do not discuss Khok Phanom Di here). Only domesticated pigs and chickens have been reported from the Ban Kao site. Very little is known about the subsistence economy and settlement patterns of sites in this region, although we do know that not all sites share the same diagnostic assemblages and not everyone lived in the alluvial lowlands. How can we explain this varied archaeological evidence?

PREVIOUS INTERPRETATIONS

Two interpretations regarding the development of "Neolithic" Ban Kao have been offered. First, based on a diffusionist framework, Sørensen proposed that the Ban Kao culture was the result of migration of Lungshanoid farmers from southern China. In terms of their subsistence-economy, Sørensen suggested that

the people probably lived in small groups, possibly in houses built on piles. Their economy was based on some agriculture and a little pig breeding, supplemented by hunting and fishing (Sørensen and Hatting 1967:147).

Based on the presence of a large amount of burnt clay, he suggested that slash-and-burn agriculture was introduced to Ban Kao, because it was not until the early metal age that wet rice agriculture and irrigation were introduced. Furthermore, he assumed that the "Neolithic" settlement consisted of sedentary villages located along the river (Sørensen 1988:67).

Second, Gorman (1977) proposed a local development of domestication within the context of the Hoabinhian. According to his model, a new technocomplex developed in association with the settlement of the piedmont and later of the lowland areas and included a subsistence economy based on rice agriculture. Gorman viewed Ban Kao as an example of the beginnings of early village farming in the piedmont area, which came after the migration of "Hoabinhian" populations from the upland areas.

Additionally, Bellwood (1993) has suggested that the distribution of the "Ban Kao" Neolithic assemblages and the introduction of agriculture to the Malay Peninsula were the results of colonization by Austroasiatic agricultural populations, as part of an argument concerning the origins of the Senoi agriculturalists in Malaysia. Though this argument relates to Ban Kao, it is not considered here since this paper is limited to the archaeological record of western Thailand. I mention it because it proposes an explanation for similar artifacts distributed through Thailand and Malaysia.

AN ALTERNATIVE FRAMEWORK FOR EXPLAINING ARCHAEOLOGICAL VARIABILITY

... the development of cross-cultural comparative studies [is] aimed at the recognition of general behavioral "regularities", which in turn serves as frames of reference useful for recognizing variability in the way different cultural systems are organized (Binford 1989:261).

The available data show that there are many gaps in our knowledge of Thai prehistory, especially in interpreting the "mixed" assemblages of the "Neolithic" and the spatial and temporal variability seen in the archaeological record. Many problems have arisen. Why is it that the chronologies of nearby local sequences do not always correlate with each other? Why don't cultural developments go through the same evolutionary stages? If we

assume that "Neolithic" people generally settled down in one location, especially in lowland areas (e.g., Gorman 1977; Sørensen 1988), then how can we explain the artifacts found in cave sites? Though archaeologists have recognized these problems (e.g., Bellwood 1977, 1985; Charoenwongsa 1987; Bronson and Natapintu 1988; Bronson and Charoenwongsa 1988; Bronson and White 1992; Higham 1989), so far no satisfactory explanations have been given regarding the complexity of the archaeological record in Thailand. Almost two decades ago, Hutterer pointed out that the cultural diversity and degrees of geographical discontinuity recognisable in Southeast Asian prehistoric populations/cultures can be explained using an ecological approach (Hutterer 1976, 1977, 1982, 1983). Here, I also pursue a general ecological approach with particular focus on the issue of sedentism to explain the variability in the archaeological record in western Thailand.

From a cross-cultural perspective, the general issue of the transition from mobility to sedentary settlement systems has been of interest to archaeologists, as it involves the re-organization of a society (e.g., Bender 1978; Binford 1980, 1982, 1990; Rafferty 1985; Kelly 1992). Here, I follow Rafferty's definition of sedentary settlement systems as "those in which at least part of the population remains at the same location throughout the entire year" (1985:115). To understand sedentism, it is necessary to understand the relationship between residential and logistic mobility.

MOBILITY VERSUS SEDENTISM

Kelly (1992) and Rafferty (1985) have done extensive reviews of these issues. Therefore, I will only briefly summarize the major points. Since the shift to a sedentary settlement pattern is often associated with a change in mobility strategy, a general concept of mobility is presented here. Understanding a process of reduction in hunter-gatherer mobility may provide an understanding of the process of sedentarization.

Researchers suggest that mobility is the key component of hunter-gatherer response to variation in resource distribution, abundance, availability, predictability and accessibility (Binford 1980, 1982; Kelly 1983). Binford (1980:10) has developed the widely used concepts of residential and logistical mobility as a conceptual framework to help understand the archaeological record. Residential mobility refers to local groups frequently moving their residential camps relative to resources in a homogeneous environment, whereas logistical mobility refers to an organization in which members of a group establish a base camp from which specialized task groups

fan out to exploit specific resources. Reduction in residential mobility will lead toward increasing complexity through a process of sedentarization (Price and Brown 1985).

So far, the causes of sedentism are still open to question. Kelly (1992:51-54) summarizes three major motivations for the development of sedentism; resource abundance, resource scarcity and social competition. The basic argument for resource abundance is that sedentism is encouraged by abundance and availability of resources. Sedentism can also arise from resource scarcity because hunter-gatherers need to extend more effort to gather, harvest and store resources. The social competition hypothesis suggests that sedentism is a response to increasing intergroup competition such as feasting, trade (e.g., Bender 1985; Hayden 1990; Kelly 1991) and conflict (Brown and Price 1985:438).

Nevertheless, researchers point out that we cannot treat sedentism as separate from mobility (e.g., Binford 1980, 1990; Eder 1984; Kent 1989; Kelly 1992). Instead we should try to understand the multi-dimensional nature of mobility in response to physical and social environments. The following observations may help us to explain the nature of the mixed archaeological assemblages characterizing the "Neolithic" in western Thailand.

- a) When sedentary settlements emerge, they do not necessarily involve all of a region's population (Kelly 1992:50). In other words, as some groups reduce their residential mobility, others may continue to be residentially mobile or continue to be foragers. Recently, archaeologists have systematically studied the interaction between farmers and foragers (Spielmann 1986; Gregg 1988, 1991). In some cases, the foragers develop a mutualistic relationship with the agriculturalists who settle down in permanent villages. According to Gregg (1988:42), mutualistic interaction "occurs when two populations exchange goods or services to cooperatively exploit a range of resources." In fact, these interactions have long been recognized by researchers in Southeast Asia both archaeologically (e.g., Hutterer 1974, 1976; Headland and Reid 1989; Endicott and Bellwood 1991; Junker 1993) and ethnographically (e.g. Peterson 1978; Eder 1984; Griffin 1984; 1989; Griffin and Estioko-Griffin 1985; Headland 1987; Brosius 1991).
- b) There are sedentary agricultural groups who are occasionally mobile or leave for short periods (e.g., hunting trips, exchange) and return to stay at the same location for the rest of the year (Kent 1989:1-17). Among contemporary agriculturalists in Southeast Asia, mixed economies of gathering, hunting, fishing

and farming have commonly been observed (e.g., Condominas 1977; Griffin 1989). The mixed economy also relates to mobility strategies.

Cross-cultural studies of ethnographic data, ethnoarchaeology and general ecological data are often used as sources of information for constructing theoretical frameworks. The frameworks serve to generate expected patterns of material remains in the archaeological record. Some of the possible archaeological implications for a transition to sedentism include increasing artifact diversity, changing refuse patterns, increasing midden development, increasing utilization of heavy implements, evidence of disease vectors promoting bacterial, viral and parasitic infection, and substantial houses and communal structures (Flannery 1972; Jackson 1985; Rafferty 1985; Kent 1989; Binford 1990; Kelly 1992).

It is important to note that it is not possible to address completely the complex nature of sedentism here; thus a number of aspects concerning this issue are not included. Also I am, of course, not implying that this ecological approach is the only framework that can be used to address the issue of sedentism and explain past human behavior. Other approaches, such as Marxist (Bender 1978) and post-processual (Hodder 1990) can be applied. Instead, I am providing an alternative to diffusionist frameworks and am examining the same problem from a new theoretical perspective.

DISCUSSION AND CONCLUSION

Up to this point, I have provided an overview of the nature of the evidence from local and regional contexts. The archaeological record of the "Ban Kao culture" is of particular interest with regard to the issue of sedentism. Since "Ban Kao" was labelled a "Neolithic" culture, it was often defined as including the invention of food production, pottery, polished stone adzes and sedentary villages.

Several points should be made regarding these issues. First, most chronological frameworks used in Southeast Asia still depend on the underlying assumption that the change from one stage to another occurs in a uniform sequence in all regions (Hutterer 1976). For instance, Hoabinhian preceded Neolithic, or polished stone preceded metal implements, and these cultural types or technologies could not have co-existed. Archaeological and ethnographic data show that the interactions between cultures with the same and with different forms of organization have existed synchronically. Hence, we cannot simply assume that cultural change happens in a homogeneous sequence over time and space.

Second, a relative chronology is typically applied to local and regional sequences. Very little radiometric dating and few systematic detailed analyses of total assemblages have been done. Each site needs to be studied in depth. Pottery has received considerable attention in most archaeological research in Thailand as a marker of "Neolithic" culture. We have yet to evaluate seriously the data from a variety of other artifact classes (e.g., faunal and floral remains, raw materials, human remains) or interassemblage variability among "Neolithic" sites within and between different geographical areas. Ban Kao is often used to represent the "Neolithic" of the whole region. Careful attention should be paid to assumptions and interpretations about Ban Kao because researchers recently have observed archaeological variability in both local and regional contexts. The use of one single site to represent the whole region should be critically re-evaluated.

Third, it is generally assumed that there is an association between agriculture and sedentism which leads towards the development of socio-economic inequality (Bellwood 1985). The major differences between foragers and farmers are the latter groups' greater reliances on domesticated plants and their reduced mobility. However, it is clear from the archaeological record in southwestern Asia (Bar-Yosef and Belfer-Cohen 1989), the American Southwest (Wills 1988), the American Northwest Coast (Ames 1991) and Japan (Soffer 1989) that innovations such as pottery, polished stone tools, agriculture and permanent settlements were not temporally and spatially contemporaneous phenomena. Terms like "Neolithic" should probably be dropped or clearly defined. Archaeological evidence indicates that there is no necessary correlation between agriculture and sedentism. We know now that agriculture may precede sedentism (Brown 1985; Kelly 1992). Moreover, sedentism is not only found among agricultural groups but also among the hunting-gathering groups, for example, on the North American Northwest coast and in Japan (Hayden *et al.* 1985; Ames 1991; Watanabe 1992). In our Thailand case we still lack evidence for cereal cultivation, though bones of domesticated animals have been discovered.

Fourth, the problem with previous interpretations of subsistence-settlement patterns is that they are often assumed rather systematically demonstrated. Thus far little is known of "Neolithic" settlement, subsistence economy and social organization, partly because no full systematic detailed analyses have been conducted on other sites since publication of the original Ban Kao report. The Ban Kao monograph is a cookbook for "Neolithic" phenomena in the region. Current evidence (Leong 1991) has

proven Sørensen's migration model of "Ban Kao" culture to be wrong. Moreover, his interpretation of slash-and-burn agriculture is questionable. From an ecological explanation, Hutterer (1983) has pointed out that the use of slash-and-burn methods should not be considered as an early stage of agriculture but rather as specific forms which are used according to specific environments and social conditions. Gorman's indigenous development model seeks to explain the transition from hunting-gathering (Hoabinhian) to food production through changes in settlement patterns. He suggests that the piedmont areas were the most probable natural environment for early agriculture for a number of reasons, such as the availability of upland floral and fauna and proximity to water resources (Gorman 1971). So far, no evidence of domesticated plants has been found in upland and piedmont sites (Penny 1982; Yen 1977), so Gorman's model still lacks support.

Fifth, besides cemetery sites, we certainly need fine-scale chronological control for entire settlement systems including habitation sites, temporary camp sites, field sites and workshop sites which will help to indicate the duration or length of occupation. Regional survey should be undertaken to address questions of the use of sedentary strategies in interactions between humans and their environments. In addition, it will help to explain changes in settlement strategies from mobile to sedentary and changes in the subsistence economy. The question of the relationship between agriculture and sedentism can also be pursued by field procedures such as systematic sieving for seeds and bones, and by various laboratory analyses such as phytolith analysis, stable-isotopic analysis, pollen and microfauna analysis. These will increase the quantity and quality of subsistence data and increase information on resource structure.

Sixth, given the complexity of tropical environments, the contrast between seasonal tropical and tropical rainforest environments is quite clear (Hutterer 1982). Western Thailand falls within the former while southern Thailand and Malaysia fall in the latter environmental zone. It would be interesting to compare archaeological sites from the two environments in greater detail. We might find different adaptive strategies in response to local environmental variability.

Finally, I suggest there are three possible developmental patterns of sedentism within local and regional contexts. One, agricultural communities could be derived directly from hunter-gatherer populations. Two, some hunter-gatherers perhaps did not adopt food-production and maintained their hunting-gathering subsistence strategies, perhaps interacting with in-migrating agricul-

turalists and maintaining their autonomy by continuing their movement. In other words, the two different organizational types can co-exist. Three, agriculturalists could have continued practicing a mixed economy including the hunting of wild game, gathering and fishing in order to supplement their agricultural products. These possibilities could be woven into a model to explain the variability in the archaeological record regarding the relationship between mobility and sedentism.

I hope this paper will stimulate more critical awareness of the complexity of sedentism and its manifestations in the archaeological record. The simple equation that Neolithic equals rice agriculture and sedentary village life should be dropped or re-evaluated. We are still far from being able to interpret confidently the current archaeological record regarding the "Neolithic". What we know about "the nature of sedentism" is clearly less than we originally thought!

ACKNOWLEDGEMENTS

My special thanks is extended to my fellow editor Elisabeth Bacus for her insightful comments for this paper and her enthusiasm for our session. Thanks also are due to Lucia Allen Yaroch for her comments on an earlier version. This paper was made possible by a number of grants. The survey in 1989 and excavation in 1990 were supported by the Development and Research Institution, Silpakorn University. Writing this paper at the University of Michigan was assisted by a grant from the Museum of Anthropology, University of Michigan, a Developing Countries Training Fellowship from the Wenner-Gren Foundation for Anthropological Research and a Southeast Asian Introductory Fellowship. Finally, I thank the Rachkam School of Graduate Studies for sponsoring my trip to the 15th IPPA congress and the Indo-Pacific Prehistory Association for my accommodation in Chiang Mai.

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