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THE PETCHABUN PIEDMONT SURVEY: AN INITIAL INVESTIGATION OF
THE PREHISTORY OF THE WESTERN BORDERS OF THE KHORAT
PLATEAU, NORTHEAST THAILAND

University of Pennsylvania

Ph.D. 1986

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JAMES STERLING PENNY, JR.

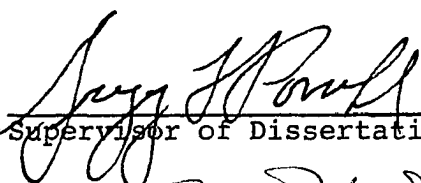
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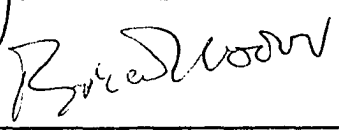
ANTHROPOLOGY

Presented to the Faculties of the University of
Pennsylvania in Partial Fulfillment of the
Requirements for the Degree of Doctor of Philosophy.

1986



Supervisor of Dissertation



Graduate Group Chairperson

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1986

DEDICATION

In Memory of
Dr. Chester F. Gorman
(1938-1981)

A scholar, a friend, and the inspiration for this work.

ACKNOWLEDGEMENTS

A project of this scope could not be completed without the help of a great many people. I shall not attempt a complete list for fear that my faulty memory would omit someone inadvertently. However, I do wish to express my appreciation to everyone who lent a hand literally or figuratively, and will do so in the following general acknowledgements.

I would like to extend my heartfelt thanks to the Expeditions Committee of The University Museum for their financial support of the fieldwork. The fieldwork was enhanced by a small grant for language study from the Department of Anthropology, University of Pennsylvania.

Nai Dejo Savanananda, Director General of the Fine Arts Department of Thailand, was the official host for the research in Thailand. He and members of this staff provided professional and personal assistance to this project. Pisit Charoenwongsa, Thai codirector of the Northeast Thailand Archaeological Project, accepted and encouraged my work as part of the larger joint effort between the Thai Fine Arts Department and The University Museum. The fieldwork specifically, and my appreciation of Thailand in general, was

greatly enhanced by the language training I received at the Chiang Mai Language Center under the tutelage of Khru Urah and her staff. The efforts of Duangkheo Phiramol, Lung Li, and the other people who worked for me in the field and at our headquarters in Ban Chiang are great appreciated. Government officials and citizens of the various provinces, districts, and villages where I worked cooperated fully and their hospitality left many fond memories. Numerous other individuals in Bangkok and "upcountry" made contributions to the project and each one is appreciated.

The laboratory analysis conducted at The University Museum in Philadelphia benefited from the advice of numerous people, particularly William Schauffler who initiated the computer coding procedures used in the analysis. John Hastings and Cheryl Applebaum assisted in coding artifacts. Julia Knight, Lisa Gimbel, and Steve Mueller (Baileys Harbor, Wisconsin) made artifact drawings.

I am also very appreciative of the assistance I received while writing from Dr. George Gumerman, Director, Dr. Brian Butler, Associate Director, and other personnel of the Center for Archaeological Investigations, Southern Illinois University at Carbondale. Beth Rusk was the word processor operator for this final draft. Bonnie Gums prepared the figures, except for the few Beth produced on the word processor.

Chet Gorman was enormously important to this work. He guided me through the proposal and fieldwork phases, but sadly, did not live to see completion of the work. I am greatly indebted to Dr. Gregory L. Possehl who took over in midstream to complete the difficult task of supervising this dissertation. My thanks also go to Dr. Robert H. Dyson, Jr. and Dr. Bernard Wailes who served on my dissertation committee. Their advice was greatly appreciated. Dr. Heather Peters also read the first and second drafts and provided valuable input.

Lastly, but really firstly, I want to thank my wife JoAnne. She shared both the best and the worst time involved in this project.

ABSTRACT

THE PETCHABUN PIEDMONT SURVEY: AN INITIAL INVESTIGATION OF THE PREHISTORY OF THE WESTERN BORDERS OF THE KHORAT PLATEAU, NORTHEAST THAILAND

JAMES STERLING PENNY, JR.

Supervisor: GREGORY L. POSSEHL

Models of Southeast Asian prehistoric cultural development based on recent excavations in North and Northeast Thailand hypothesize that early village farming arose from the indigeneous Hoabinhian occupation. The Petchabun Piedmont Survey was designed to test the particular idea expressed in those recent models that agriculture developed in a piedmont setting and in the form of a transition between mountain-oriented Hoabinhian hunting and gathering, and plains-oriented village farming. The survey covered eleven 10 x 10 km grid squares along the western piedmont borders of the Khorat Plateau, Northeast Thailand. Forty five sites were recorded and, subsequently, test excavations were conducted on three of these sites.

The three excavated sites had similar ceramics and similar assemblages of other artifacts. Carbon-14 dates range in the first millenium B.C. Similarities between the

excavated ceramics and surface ceramics from other sites demonstrate that most, and suggest that all, of the prehistoric open sites found in the survey pertain to the same cultural cluster. These were designated Phu Kradung ceramic sites. Four sites from an adjacent area surveyed by the Pa Mong project were also recognized as Phu Kradung ceramic sites. Neither the Petchabun Piedmont Survey nor the literature provide any evidence for Hoabinian, transitional, or early village farming occupation of this particular piedmont zone.

Two major conclusions were drawn. First, extant models of Southeast Asian cultural development need to be reevaluated. Alternatives are discussed and another model is introduced in which agriculture arose from a shift in the subsistence base of hypothetical early plains occupants. Second, the survey results and current literature demonstrate that the Southeast Asian Iron Age witnessed settlement expansion and development of key elements of the enormously important wet rice agricultural complex. Data from the period are reviewed and some concluding suggestions are made as to their theoretical significance for studies of cultural development in Southeast Asia.

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CHAPTER ONE
ARCHAEOLOGICAL BACKGROUND

Introduction: Development of Prehistoric
Studies in Southeast Asia

The archaeology of mainland Southeast Asia (Figure 1-1) has blossomed in recent years. Very little credence is now given to the old cliché that Southeast Asia was a prehistoric cul-de-sac which passively waited to receive innovations from its neighbors while giving nothing to the world.

One result of the old view of prehistoric Southeast Asia as a "backward" area was a relatively low level of interest in archaeological work. Cultural sequences were generally based on interpretations of historic documents rather than on systematic archaeological work. More recently, archaeological interest has been stimulated both by the emergence of national archaeological programs (Van Tan 1964; Charoenwongsa 1982) and by suggestions that Southeast Asia was the scene of indigenous developments in agriculture, animal domestication, and metallurgy (Bayard 1971a; Gorman 1971; Gorman and Charoenwongsa 1976). Detailed criticisms of old theories in the light of new data have been provided by Bayard (1977, 1980a), Davidson (1979), Gorman and

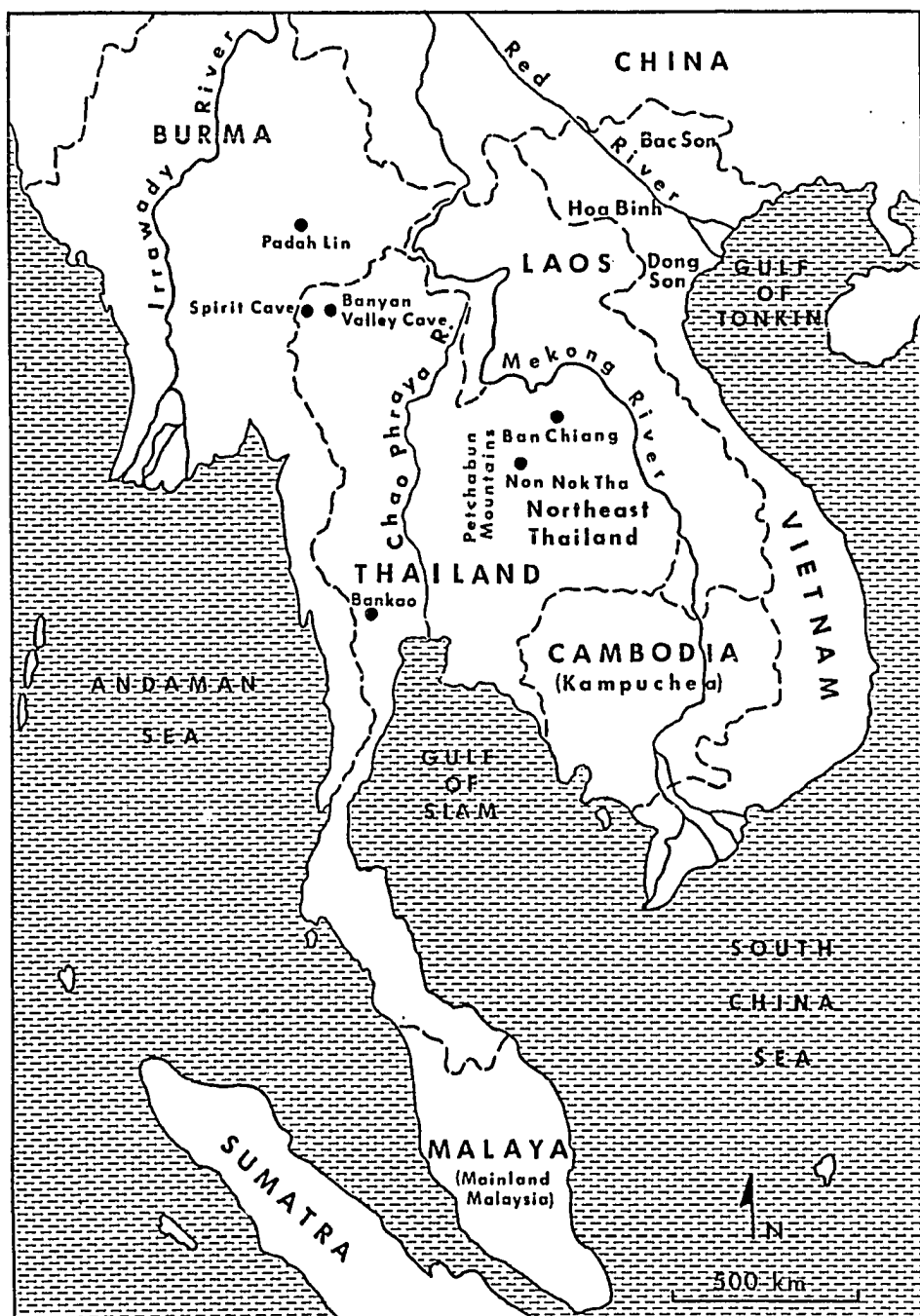


Figure 1-1. Mainland Southeast Asia with selected sites and localities.

Charoenwongsa (1976), and Higham (1972). There is no need to repeat details of these criticisms here. Essentially, serious work has begun on elucidating cultural sequences for prehistoric Southeast Asia based on archaeological data.

Southeast Asian cultural sequences can now be interpreted in terms of two major prehistoric configurations: Hoabinhian and "village farming". Hoabinhian sites are generally characterized by a flaked stone technology, a broad spectrum hunting, fishing and gathering economy, and a settlement pattern strongly oriented to upland karst formations. Assemblages from upper levels of Hoabinhian sites are modified by the addition of pottery and other items which are generally associated with lowland rice agriculture. Village farming sites are generally characterized by a technology which includes pottery from the earliest known sites and later metallurgy, an economy including domestic animals and some form of rice agriculture, and plains settlement (frequently mounds). Details of the Hoabinhian and village farming sequences are presented later in this chapter. In terms of this research, the importance of these two configurations lies in suggestions that early village farming on the plains of Southeast Asia had indigenous origins in the Hoabinhian.

The Research Problem: A Preview

Some form of hypothetical transition between the Hoabinhian and early village farming has been suggested by several archaeologists working in mainland Southeast Asia (Solheim 1972; Higham 1972; Gorman 1977). Put in its simplest terms, the central theoretical problem selected for this research was that there were no known sites representing this hypothetical indigenous transition.

Technological items found in upper levels of Hoabinhian sites suggest interaction with lowland agriculturists. However, the earliest plains agricultural sites known so far are not only fully developed but also are about 3000 years later than the earliest Hoabinhian sites with these modifications. Hoabinhian and village farming sites exhibit strongly contrasting settlement orientations. This suggests that representative transition sites may not have been found because the (very limited) archaeological work conducted in Southeast Asia has not been concerned with the intervening geographical areas. Details of the research problem are developed in the following review of literature relevant to development of the outline of Hoabinhian and village farming prehistory.

Review of the Literature

Hoabinhian

The term "Hoabinhian" was initially defined based on the 1920's work by the French archaeologist Madeleine Colani in the northern Vietnam province of Hoa Binh (Figure 1-1). Matthews (1968) translated the following resolution from the First Congress of Prehistorians of the Far East which met in Hanoi in 1932:

It is proposed to accept the following terminology and to recommend its use to the First Congress of Pre- and Protohistory:

Hoabinhian: a culture composed of implements that are in general flaked with somewhat varied types of primitive workmanship. It is characterized by tools often worked only on one face, by hammerstones, by implements of sub-triangular section, by discs, short axes and almond-shaped artifacts, with an appreciable number of bone tools. (Matthews 1968:86)

Matthews (1968) also reviews other early work on Hoabinhian sites in northern Vietnam including continued work in the Hoa Binh region by Colani and later by the Russian archaeologist Boriskovsky, and work in the Bac Son region by Mansuy collaborating with Colani. Matthews (1968) summarized his findings as follows:

Despite the unsatisfactory nature of the published material, the excavations in Indo-China have sketched the outlines of a distinctive culture, based on a hunting and food-gathering economy, with flaked stone artifacts made primarily of pebbles. It was a mesolithic culture in that it exhibited no evidence of agriculture. The rather inadequate faunal data would seem to indicate a post-Pleistocene date. (Matthews 1968:94)

Since the time of Colani, Hoabinhian sites have been found in every other country in mainland Southeast Asia: South China (Chang 1977:76-79), Laos (Saurin 1952; Bellwood 1979:69-70; Bayard 1980b:91-97), Cambodia (Mourer and Mourer 1970; Carbonnel and Delibrias 1968), Thailand (Heider 1960; Heekeren and Knuth 1967; Gorman 1972), and Mainland Malaysia (Sieveking 1954; Dunn 1964). However, prior to the late 1960's, interpretation of the Hoabinhian was at about the same level of analysis as that by Matthews cited above. Stone tools were described in some fashion and characterized as Paleolithic or Mesolithic, or Neolithic when found with pottery. In the absence of radiocarbon dates, even the best stratigraphic excavations did not yield very useful cultural sequences due to the lack of diagnostic attributes among the flaked stone tools.

A major rethinking of the Hoabinhian was accomplished by Gorman (1969, 1972) based on his excavations at Spirit Cave. The Spirit Cave sequence was dated by stratigraphy correlated with C-14 determinations. Extrapolation from the dates indicate initial occupation about 11,000-12,000 B.C. Careful excavation yielded a series of plant remains found in association with the Hoabinhian occupation levels. These include a series of food plants which, by morphological change and distribution beyond native habitats, indicate development beyond simple food gathering, perhaps the very early use of domesticated plants (Gorman 1971:310-311). Yen

(1977) has published his Spirit Cave floral analysis, but concludes that the evidence is inconclusive with regard to possible Hoabinhian horticulture. Upper levels at the site yielded (in addition to flaked stone tools) flaked-and-polished stone adzes, pottery, and small slate knives. When these items are next seen in the archaeological record, they are associated with a complex which included rice agriculture. These "modified Hoabinhian" levels at Spirit Cave were associated with C-14 dates between 6900 and 5700 B.C. The Spirit Cave excavations, thus, demonstrated that the Hoabinhian extended back into the Pleistocene and may have included some form of plant manipulation. The dated sequence also allowed placement of the modified assemblages in a chronological framework, starting ca. 7000 B.C. (Figure 1-2).

As a result of his excavations and a review of the literature, Gorman (1972) listed six key traits of the Hoabinhian:

1. a generally unifacial tool tradition made primarily on water rounded pebbles and large flakes detached from these pebbles;
2. core tools ("Sumatraliths") made by complete flaking on one side of a pebble ... and grinding stones also made on rounded pebbles ..., usually in association with iron oxide;
3. a high incidence of utilized flakes (identified from edge-damage characteristics);
4. fairly similar assemblages of food remains including remains of extant shellfish, fish, and small and medium-sized animals ...;
5. a cultural and ecological orientation to the use of rock shelters generally occurring near fresh water streams in an upland karstic topography

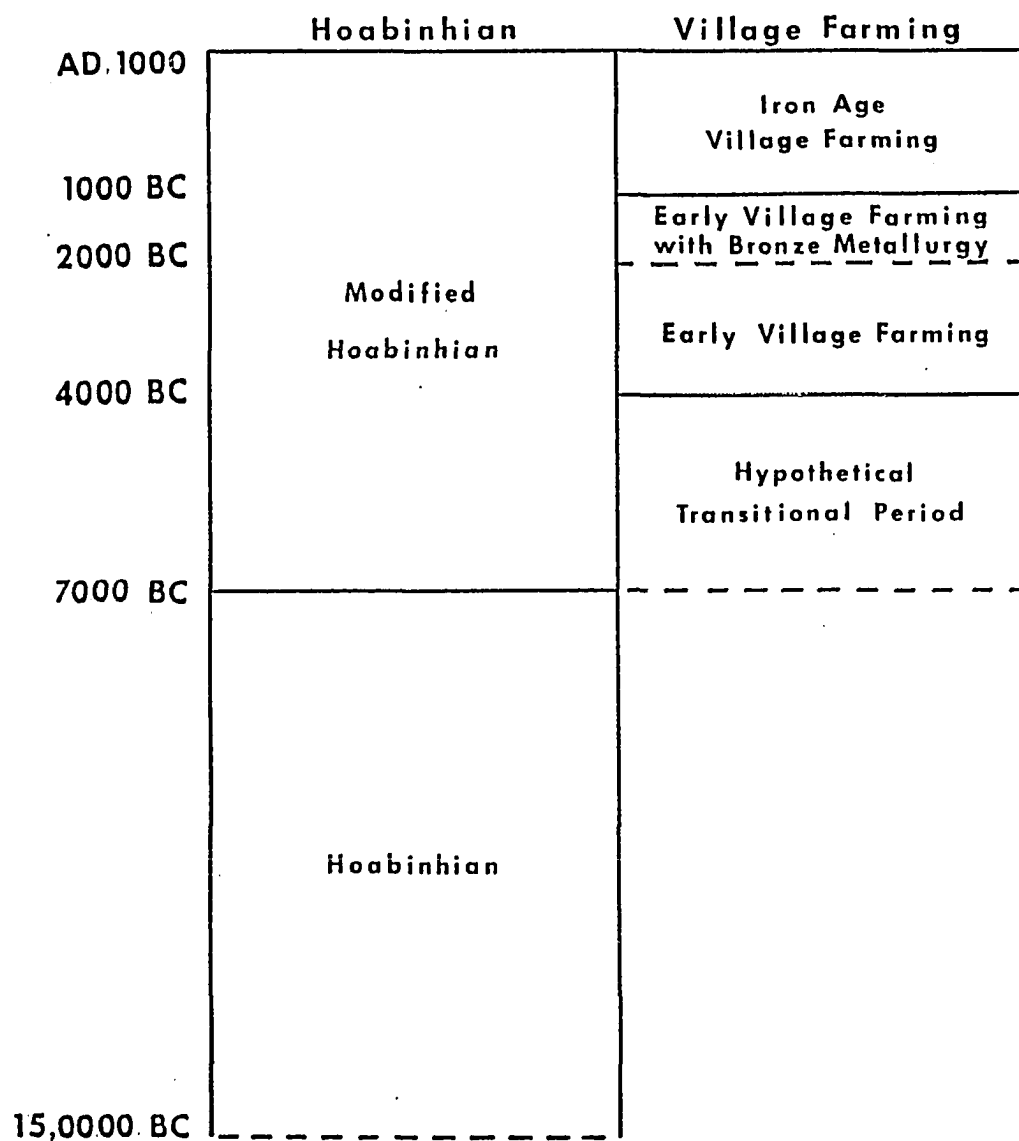


Figure 1-2. Prehistoric cultural/temporal periods.

(though Hoabinhian shell middens do indicate at least one other ecological orientation);
 6. edge-grinding and cord-marked ceramics occurring (though perhaps as intrusive elements), individually or together, in upper layers of Hoabinhian deposits. (Gorman 1972:82)

Gorman (1972) redefined the Hoabinhian as a technocomplex.

TECHNOCOMPLEX. A group of cultures characterized by assemblages sharing a polythetic range but differing specific types of the same general families of artefact-types, shared as a widely diffused and interlinked response to common factors in environment, economy, and technology. (Clarke 1968:357)

The Hoabinhian technocomplex appeared by at least 15,000 B.C. (Gorman 1977) and continued without major modifications until about 7000 B.C. (Figure 1-2). Modified Hoabinhian assemblages appear about 7000 B.C. Dates of A.D. 900 from Banyan Valley Cave in North Thailand (Higham 1979:673) and A.D. 750 from Laang Spean in Cambodia (Mourer et al. 1970:471) indicate that the modified Hoabinhian continues into the first millennium A.D. in at least some locations. The Spirit Cave floral evidence indicates that the technocomplex may have included early plant manipulation, perhaps even domestication (cf. Flannery 1973).

Subsequent work has tended generally to confirm Gorman's view of the Hoabinhian sequence. The Burmese site of Padah-lin has yielded a radiocarbon date ca. 11,500 B.C. (Thaw 1971) which confirms Gorman's extrapolation of the beginning of the Hoabinhian sequence at Spirit Cave.

Pookajorn (1981) has recently reviewed Hoabinhian sites, including three recent Thai excavations. He concludes (Pookajorn 1981:110-111) that a two-stage model (ie. what is termed here Hoabinhian and modified Hoabinhian) is the most appropriate. Gorman's general date of 7000 B.C. for the initial appearance of modifications in Hoabinhian assemblages is not contradicted by the radiocarbon dated sequences reviewed by Pookajorn (1981:11-25) nor by the results of the Thai excavations (Pookajorn 1981:50-58). A Hoabinhian site has been located along the bank of the Mekong River in Thailand (Bayard et al. 1974; Bayard 1980b), but it is still true that almost all Hoabinhian sites have been found in karst uplands and that none have been found in open plains settings. Unfortunately, there has not been any advance in the study of plant remains which would clarify the debate over possible Hoabinhian horticulture (Yen 1977).

Village Farming

We now turn to the group of plains sites. These have not been formally defined as a generalized archaeological entity. The terminology here is adapted from Gorman's use of "early village farming" to describe Stage II of his model for the beginnings of agriculture in Southeast Asia (Gorman 1977:343-345). Following Gorman, I have included bronze metallurgy as a technological addition during the early village farming period (Figure 1-2). The period equivalent

to Gorman's Stage III (iron technology and settlement of alluvial plains; Gorman 1977:345-348) is viewed here as a continuation of the village farming sequence with important new technology (iron, domestic water buffalo and paddy rice agriculture), and is termed "iron age village farming" (Figure 1-2).

The traditional view was that Southeast Asia had a late Neolithic (ca. 2500 B.C.) which lasted up to the introduction of bronze metallurgy from China ca. 500 B.C. (Bellwood 1979:161; Bayard 1980a:91). Prior to the late 1960's, the only well-described "Bronze Age" assemblages were those of the Dong Son, named after their focal area in northern Vietnam (see Bellwood 1979:183-191 for a succinct review). These assemblages are noted for the elaborately decorated bronze drums which have been found at widespread locations in mainland and insular Southeast Asia (Bellwood 1979: Figure 7.27). The interpretation of the Dong Son bronze drums as a late and Chinese-influenced development appears to be substantially correct. The problem, as will be shown shortly, is that they are not representative of early bronze metallurgy in Southeast Asia.

Major excavations were conducted in 1961 and 1962 at Ban Kao in west central Thailand (Figure 1-1) by the Thai-Danish Expedition (Sorensen and Hatting 1967; Sangvichien 1969; Sorensen 1973). The initial major report (Sorensen and Hatting 1967) described only the burials in detail

although a massive amount of occupational debris had also been found. Grave goods included cord-marked and incised ceramics, and polished stone adzes. All but two of the burials were ascribed on typological grounds to early and late Neolithic phases. The two exceptions had iron tools in association and were attributed to an Iron Age phase. A series of radiocarbon dates between 1800 and 1300 B.C. were obtained from the main excavation at the Bang site (Smith and Watson 1979: Appendix I). Sorensen (1972) attributed the origins of this culture to the Chinese Lungshanoid, possibly via a migration from the area of Lungshanoid origins in the lower Huang Ho area, a straight-line distance of about 3000 km northeast of Ban Kao. Sorensen's interpretation of the Ban Kao evidence has been strongly criticized (Parker 1968; Solheim 1969a; Bayard and Parker 1978; MacDonald 1980). Without going into details of the criticism, it appears that an injustice was done to the Ban Kao data in attempting to force them into the then-accepted picture of Southeast Asian cultural development as late and derivative.

A major rethinking of prehistoric village farming was brought about by the excavators of Non Nok Tha (Solheim 1969b, 1972; Bayard 1971a, 1971b). Non Nok Tha is a mound site near Phu Wiang, an outlying monadnock in the northwestern quarter of Northeast Thailand (Figure 1-1). Rice (oryza sp) was found from the earliest levels along with

cordmarked pottery and the remains of domesticated cattle and pigs (Bayard 1971a; Higham 1975a). A copper tool was found in a late Early Period level and bronze tools with evidence of casting were found from the beginning of the Middle Period (Bayard 1971a:33). Dating of the Non Nok Tha sequence has been controversial, but Bayard (1977:64) believes that there is "strong but not unequivocal support" for the early sequence and "...that the various phases at Non Nok Tha should be dated as follows: Early Period, from ca. 3500 - 2500 BC; Middle Period 2500 BC - 200 AD; Late Period ca. 1000 AD to present." The Non Nok Tha excavation, thus, demonstrated that Southeast Asia had a "Bronze Age" distinct from and much earlier than the Dong Son, and that rice agriculture and domestic animals were present at a date much earlier than previously thought. Iron was not found in prehistoric levels at Non Nok Tha. However, iron was found in prehistoric contexts not long after the Non Nok Tha excavations (Higham and Parker 1970; Bronson and Dales 1973).

One other site played a key role in the development of the village farming sequence. This site is Ban Chiang in Northeast Thailand (Figure 1-1). Dates from the Ban Chiang sequence (Gorman and Charoenwongsa 1976; and see White 1982a for a revised chronology using dates not available in 1976) supported the controversial "early sequence" of dates from Non Nok Tha (Bayard 1977: 63-65), and therefore, confirmed a

fourth millennium B.C. date for initial occupation of these two sites. The Ban Chiang sequence also includes early iron which appears in the Middle Period (1000 - 300 B.C.; White 1982a). Ban Chiang's Middle Period also yielded evidence for the advent of the highly important plowed paddy rice system. The evidence is in the form of indications that the domestic water buffalo were used for traction and in the disappearance of certain snail species which are abundant in wetlands but absent in paddy fields (Higham and Kijngam 1979; Higham et al. 1981). This evidence was a key to consideration of iron age village farming as a distinct phase (Figure 1-2).

The village farming sequence ends at A.D. 1000 in Figure 1-2. There are two reasons for this. First and foremost, this date (following Bayard 1980b:25) is specific to the advent of the historic period in Northeast Thailand (see below) and clearly marks a major change in the sequence. Second, the same ending date appears to be generally appropriate for Southeast Asia. Protohistoric and historic developments do begin in the first millennium A.D. but village farming life appears to continue relatively unchanged (for example, see Bronson 1976). A more complete discussion of iron age village farming is included in Chapter 7.

In summary, archaeological data from certain Southeast Asian plains sites has yielded data for a village farming

sequence involving early rice agriculture and animal domestication, a period in which a sophisticated bronze metallurgical tradition arose, and a period in which iron technology and paddy rice agriculture were developed. The general sequence (Figure 1-2) appears to be quite well established, although the exact dating of periods has been controversial and has been called into question again recently (Higham 1981). The dating used here appears to be reasonable to me, and in any case, the exact dates are not at issue in this research.

A Note on Comparative Literature

The preceding literature review dealt with the development of prehistoric sequences for mainland Southeast Asia, and as such, can serve as a general background for regional prehistory. Data, of widely varying quality, is now available for a considerable number of sites, particularly in Thailand, Vietnam and South China. These data generally fit the described outline of sequences (see Bayard 1980a for a general review). Certain of the available site literature is used in Chapter 6 to compare with the results of this research, and a problem which arose in that regard can be anticipated here. The research was designed to be a test of a general proposition in the form of a contribution to regional research in Northeast Thailand. However, although Northeast Thailand is one of the better-studied regions

within Southeast Asia, certain comparative data would not be available if research was strictly confined to the region. In particular, there are no Hoabinhian sites known from uplands in Northeast Thailand. Therefore, detailed literature comparisons were systematically extended to include the regions surrounding Northeast Thailand (North and Central Thailand, Laos, and Cambodia). The regional research is described later in this chapter and the geographical regions are described in Chapter 2.

Other Supporting Evidence

The revised views of Southeast Asian prehistory receive a limited amount of support from non-archaeological data.

The linguistic work of Benedict (1975) parallels the new archaeological reconstructions and strongly supports the idea of indigenous development of agriculture, animal domestication, and metallurgy in Southeast Asia. Benedict provided evidence for postulating a new language family, Austro-Thai, centered in mainland Southeast Asia. He compared Austro-Thai to ancient Chinese and concluded that a large number of ancient Chinese words were borrowed from the reconstructed language. Interestingly, these include rather complete lexicons dealing with domestic animals, domestic plants, agricultural implements, and metals.

Another independent proposal that Southeast Asia was a center of early agriculture is found in the earlier works of

cultural and plant geographers. This is based on "...the familiar premise that man learned to plant before he grew crops by seeding." (Sauer 1969:25). Since root crops were the first domesticates, they argue, the tropical areas in which major root crops are important were the early centers of domestication. However, this may not explain the process of domestication in Southeast Asia (see Gorman 1977).

Evidence from physical anthropology may be consistent with ideas of indigenous development if a continuity of population can be demonstrated. This work, however, requires fairly large comparative population samples and such work is just developing (Pietrusewsky 1974a, 1974b, 1978).

Research Design: The Petchabun Piedmont Survey

The Central Theoretical Problem

The preceding review of the literature clarifies the central theoretical problem of this research. On the one hand are Hoabinhian sites which exhibit two key traits; 1) a broad spectrum hunting, fishing and gathering economy which may include some form of manipulation of native plants, and 2) the presence after ca. 7000 B.C. of modified assemblages which suggest contact with lowland agriculturists. On the other hand is the village farming sequence. The earliest known sites in this sequence (Non Nok Tha and Ban Chiang) date to no earlier than the fourth millennium B.C. and are

apparently fully developed in terms of having some form of rice agriculture adapted to the plains environment, fully domesticated cattle and pigs, and sophisticated ceramic traditions. Thus, the period ca. 7000 - 4000 B.C. is a mysterious one in terms of the development of agriculture in the region. If, as appears likely for a number of reasons (Solheim 1972; Higham 1972; Gorman 1977), early village farming on the plains of Southeast Asia had origins in the Hoabinhian, then one would expect some form of transition between the two sequences during the designated time period (Figure 1-2). Testing of the idea of indigenous origins of Southeast Asian agriculture (or alternative origins) is, thus, focused on a particular time period and a particular hypothetical cultural interrelationship. Details of a field research program designed to tackle this theoretical problem are presented in the following section.

The Field Problem

Overall Organization: The Northeast

Thailand Archaeological Project

The Petchabun Piedmont Survey was conducted under the auspices of the Northeast Thailand Archaeological Project (NETAP), then codirected by Pisit Charoenwongsa, Fine Arts Department of Thailand, and the late Chester Gorman, The University Museum, University of Pennsylvania. The NETAP

shaped the overall organization of the archaeological research.

The Northeast Thailand Archaeological Project was organized in Bangkok in January 1973 as a joint effort by the Fine Arts Department of Thailand and The University Museum, University of Pennsylvania to pursue the investigation of the prehistory of the Khorat Plateau of Northeast Thailand. The joint agreement forming the project stated its goals:

- 1) This project will have two purposes;
 - a) to gather, evaluate and distribute scientific knowledge from prehistoric investigations in Northeast Thailand pertaining to the civilization of mankind in general and to the culture and development of early man in Thailand in particular
 - b) to train Thai archaeologists and students to a high level of professional proficiency.

The major focus of the project's work thus far has been the joint excavations at Ban Chiang (Gorman and Charoenwongsa 1976). Other phases of the work have included survey and testing by Schauffler (1976), continuing survey by Thai Fine Arts Department personnel, a major excavation at Non Chai by Thai team members (Charoenwongsa and Bayard 1983), and an ethnoecological study (White 1982b, 1984).

The research described here was designed to contribute to this project in the following ways: 1) to continue the project's systematic survey sampling of Northeast Thailand, 2) to conduct a preliminary intensive survey of an area of interest to the development of research in the region, 3) to

examine certain of the models of cultural growth and development which have been developed by research in the region, and 4) to relate the findings to current understanding of the prehistory of Northeast Thailand.

Models for the Agricultural Transition

We return here to consider the central theoretical problem as a practical field problem conducted as part of the Northeast Thailand Archaeological Project. The design of the field research was oriented by reference to autochthonous cultural sequences which address the issue of agricultural transitions. The sequences of Solheim (1972), Higham (1972), and Gorman (1977) are presented schematically in Figure 1-3 and are discussed below. While these sequences are primarily concerned with chronology, they either explicitly or implicitly incorporate hypothetical mechanisms of cultural change. Data from Harris (1973) are also discussed in relation to the hypothetical transition to agriculture.

Solheim's Sequence

Solheim (1972) was a pioneer in the development of indigenous frameworks for the reconstruction of Southeast Asian prehistory (see also Solheim 1969b). His five stage model has been criticized for inconsistencies in definition

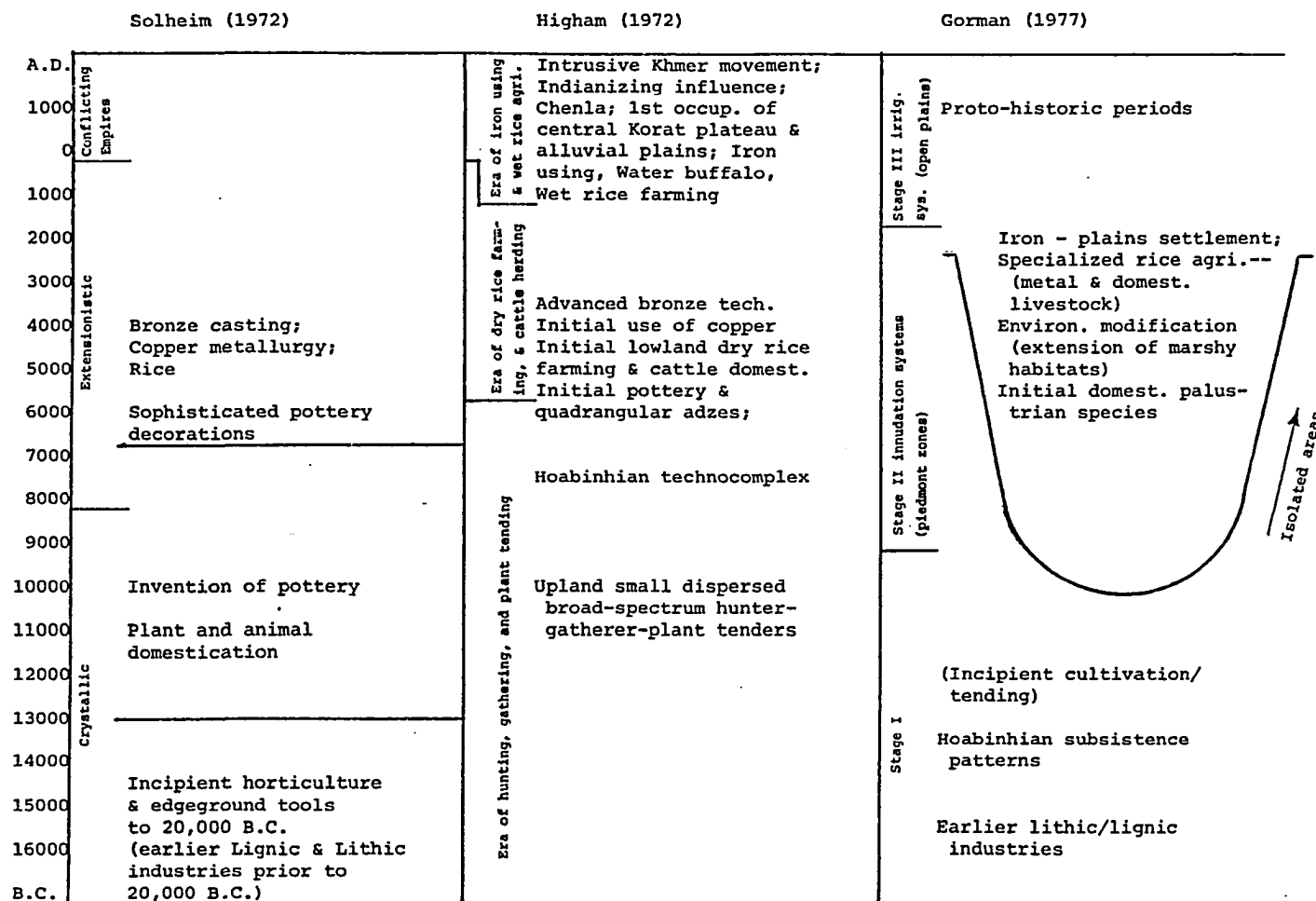


Figure 1-3. Autochthonous cultural sequences.

and his dates (which were tentative and sometimes frankly speculative) now appear overly speculative. Of particular interest here is his Extensionistic Period:

The term refers to the major trend during the interval: the movement of peoples out of the mountains where they had previously lived. (Solheim 1972:39)

He goes on to say:

I suggest that the earliest movement brought the people no further than into the adjacent piedmont. Even this movement led to enough of an environmental change, however, to make the hunting and gathering of wild plants activities of diminishing significance and to make farming much more important. (Solheim 1972:40)

Solheim states that the transition would have been gradual but provides no details of transitional mechanisms.

Higham's Sequence

Higham (1972) posits an essentially stadial model and does not directly address transitions. However, the economic/technical sequence in the model (Figure 1-3) certainly implies some kind of movements between these zones in concert with environmental variables. His model is particularly vague with regard to the beginnings of rice farming. The original domesticate is designated as dry rice. However, there is no explanation for the dry rice, hence no clue as to how rice cultivation may have begun. Non Nok Tha is taken as the example for piedmont sites in this model. However, while it is physically a piedmont site (see

Chapter 2), Non Nok Tha apparently has an economy/technology equivalent to some early plains sites (eg. Ban Chiang) and, therefore, cannot represent an exclusive piedmont development as Higham appears to claim. This version of Higham's model is really only useful here as a vague concept of movement from highlands, to piedmont, and out onto plains. Subsequently, Higham (1979) has published a more detailed discussion involving wet swidden rice in a piedmont zone. This latter paper was published after the field work and had no bearing on project planning.

Gorman's Sequence

Gorman (1977: specifically referring to the model in Figure 2) provides a model which does focus on transitions. He postulates an initial co-domestication of rice and taro in palustrian environments probably centered in a piedmont zone. The piedmont is considered the most likely zone for three reasons: 1) the ecological principle that transitional zones (ecotones) in general, and forest-edge situations especially, are optimal for initial plant domestication (see Harris 1969), 2) archaeological evidence that open plains were settled late, and 3) the presence in the piedmont of the most probable natural environments favoring rice and taro domestication, specifically "...the points where intermontane valley streams emerge into lowland marshy areas" (Gorman 1977:344). Subsequent agricultural

development and expansion occurred with a shift from limited natural inundation to much less limited artificial inundation systems.

Harris' Sequence

Harris (1973) approached the development of agriculture in the tropics through an ethnoecological model. He postulates that initial developments in agriculture began with a long phase of 'proto-cultivation' based on ecosystem manipulation by broad spectrum foragers in the forests and wooded areas of seasonally dry, intermediate tropical zones. Northeast Thailand is such a zone. Swidden agriculture then developed as a means of cultivation on a wider scale necessitated by population increase and/or inter-group warfare. This model provides a supplemental view as to why and how the transition to agriculture could have taken place. It appeared possible that upland Hoabinhian sites are examples of 'proto-cultivation' and that early open plains sites represent swidden cultivators.

Focus on the Piedmont

The cultural sequences considered above suggest, either explicitly or implicitly, that transitional sites would be found in a piedmont zone. Further, the sites should exhibit some form of transition between the (apparent) mountain

orientation of the Hoabinhian hunting-gathering-plant tending, and the plains-oriented early village farming. The most obvious case would be to find a site in a piedmont setting with an assemblage somewhat like the modified Hoabinhian (ie. with Hoabinhian stone tools, and ceramics and groundstone such as found on later plains sites). Sites with these characteristics would be expected to date to a period ca. 7000-4000 B.C.

The central field research problem could be defined in practical terms following the preceding summary of cultural sequences. Systematic archaeological work would be conducted in a piedmont zone with a major goal of determining if the expected transitional sites are present. Northeast Thailand is bordered by mountains on all four sides. To the north and east, the mountains lie across the Mekong River in Laos. Thus, they were excluded from consideration even though they would have been interesting areas, both within the theoretical context of the project, and for additional considerations of the role of the Mekong in the prehistory of the region. Of the remaining two border areas, the Petchabun Mountains on the west (Figure 1-1) were selected for the following reasons:

- 1) inclusion of known copper ore sources in the general area,
- 2) closeness to some of the available comparative sites (Non Nok Tha [above], the Nam Phong survey [Solheim

and Gorman 1966:164-179], the Phu Wiang survey [Higham and Parker 1970:25-43], the Pha Mong survey [Bayard et al. 1974], and Don Klang [Schauffler 1976]),

3) the central spatial relation of this area between known early village farming sites in the northeast and the Hoabinhian sites in the north of Thailand. This last point is important in terms of available comparative data, even though it views the distribution of sites with unwarranted simplicity.

Other Research Problems

Investigation of the hypothetical agricultural transition was designed to be a major contribution to Northeast Thailand Archaeological Project. However, the field research program was also designed to make some other, more general, contributions to regional archaeology:

1) Local Sequence. A basic regional research problem is the lack of local cultural sequences for large areas of Northeast Thailand. The area covered by this research had never been explored archaeologically and the definition of a cultural sequence for this area is a direct contribution to regional research.

2) Environmental variables. A second basic problem in regional research is that, until recently, environmental variables have not been systematically included in archaeo-

logical work in the region. Collection of data relevant to two models was integrated into the research design:

- a) Bayard (1971b) postulated a model of ecological zones based on the zones recognized by the current inhabitants of the village near the site of Non Nok Tha,
- b) Schauffler (1976) derived his survey strata from geological and resource data (soil type, water supply, rainfall, geological strata, and topography).

3) Resource distribution. There were two specific resources on which it was hoped that data could be collected in the survey:

- a) copper ore sources are known to exist on the Khorat Plateau (eg. United Nations 1968),
- b) Bayard (1971b:34-35) suggested that the origin of the material for the manufacture of ground stone adzes at Non Nok Tha lies in the mountains west of the site.

The Field Project

The field project was named the Petchabun Piedmont Survey. My wife and I were in Thailand from December 1976 through November 1978, and were the only two Americans representing the NETAP in Thailand during that time, since all other American personnel were working in Philadelphia.

The archaeological fieldwork was preceded by four months of language training at the Chiang Mai Language Center in Chiang Mai, North Thailand.

The initial stage of the archaeological fieldwork was a systematic survey conducted in 10-km grid squares distributed along the western piedmont zone (see Figure 3-1). The survey work was done from June 1977 through February 1978. Data on the location of sites was primarily obtained from structured interviews with local inhabitants, a method chosen for effectiveness in densely vegetated areas (see Solheim and Gorman 1966). The survey party visited as many as possible of the potential sites described by villagers. The survey recording was explicitly designed to be integrated with data collected in a stratified random sampling survey of the Khorat Plateau initiated by Schauffler (1976). The survey phase resulted in recording 45 sites in the formal survey grid, plus some miscellaneous sites and other information of archaeological interest. Particular details of the survey methods are presented in Chapter 3 along with the survey results.

Excavations were conducted on three of the sites found in the survey. Details of the excavation methods and results are presented in Chapter 4. This work was accomplished March to July 1978. Preliminary lab analysis, packing, shipping, and paperwork completed the field project.

Summary

Archaeological data recovered in the last two decades have revolutionized thinking about the prehistory of Southeast Asia. Cultural sequences now emphasize the early, and probably indigenous, development of rice agriculture, domestic animals, and bronze and iron metallurgy. A particular problem in these sequences was posed by the absence of evidence for the hypothetical in situ development of plains agriculture from the indigenous Hoabinhian complex. A research program, the Petchabun Piedmont Survey, was devised to investigate systematically the western mountainous margins of the Khorat Plateau, Northeast Thailand, a zone in which sites representing the hypothetical transition were expected. The research problem is primarily one of consideration of the development and interrelation of archaeological sequences in terms of geographical variables. The following chapter provides details of the geographical setting of the research.

CHAPTER TWO

GEOGRAPHICAL BACKGROUND

The Overview: Mainland Southeast Asia

General archaeological discussions in Chapter 1 encompassed mainland Southeast Asia (Figure 1-1). Here, the general geography of the area is considered as background for more specific discussions of the regions and subregions relevant to the research.

Mainland Southeast Asia (Figure 1-1) is defined here to include southern China, Vietnam, Laos, Cambodia (Kampuchea), Thailand, Burma, and Malaya (the peninsular portion of the Federation of Malaysia). Topographically, much of this area is rugged highlands (Dobby 1960; Fisher 1964; Spencer and Thomas 1971; Donner 1978). Most of the area is sketched by Spencer and Thomas (1971:Figures 6.7 and 6.8) as the Burmo-Malayan Fan, in which great "ribs" of mountains spread out southward from the knot of very high folded mountains which lie east of the Tibetan Plateau in northern Burma and southwestern China. The three main ranges extend southwesterly along western Burma (the Arakan Yoma), south along the Thai/Burma border and through Malaya (the Central Cordillera), and southeastward through Laos and Vietnam (the Annamite

Cordillera). Rugged land also extends across southern China. Major expanses of low, relatively level land lie in the great alluvial formations of the Irrawaddy River in Burma, the Chao Phraya River in Thailand, the Mekong River in Cambodia and southernmost Vietnam, and the Song-koi or Red River in northern Vietnam. The only other major expanse of relatively level land within the area is the Khorat Plateau in Northeast Thailand which is discussed in detail later in this chapter.

In general, the bedrock geology of Southeast Asia comprises sedimentary rocks of various ages which have been uplifted and folded by the Himalayan orogeny (Lekagul and McNeely 1977:XIII-XVII). Details of the geology are intriguing, but complex and largely irrelevant to this study. However, there are two points concerning geology which are of specific interest to the proposed archaeological research. One is the presence of massive limestone formations scattered across the area. Due to the particular geological conditions in the area, these formations typically are in the form of rugged hills with numerous solution caverns (Donner 1978:14). These karst uplands are closely associated with Hoabinhian occupation (see Chapter 1). The second is the location of ore sources for the metals used in prehistory. Southeast Asia is interesting for the fact that it is rich in sources for both copper and tin which together make bronze (Charoenwongsa 1977). Iron is available in some

laterite formations (see below) as well as in localized high-grade ores (United Nations 1968:48).

Mainland Southeast Asia is situated near the heart of "Monsoon Asia" (Robinson 1967). The monsoon climate is distinguished by a seasonal wind pattern in which surface winds flow rather steadily in one direction for half the year, then reverse for the other half year (Fisher 1964:21-42; Robinson 1967:20-31). In the study area, the winter monsoon streams down from the northeast and the summer monsoon comes from the southwest. The monsoon winds are a major factor in rainfall distribution. As moisture laden monsoon winds move inland, they are elevated and cooled, and their moisture condenses as rain. Most of the area receives its major rainfall during the southwest monsoon which sweeps in from the Indian Ocean, although the east-facing coastal plains of Vietnam receive their major rainfall during the northeast monsoon and some areas receive significant rainfall in both seasons. Once the rain has fallen on the windward side of highlands, the monsoon winds descending into lower interior areas are dryer. As a result of this "rain shadow" effect, some interior areas are quite dry (for example, see Fisher 1964:Figure 6). Lowland temperatures are warm, and are relatively uniform both between seasons and across the area. In the north at Hanoi, the mean monthly temperatures range from 62°F (16.7°C) in January and February, to 83°F (28.3°C) in June, July and August (Fisher

1964:Table 48). In the south at Kuala Lumpur, the temperature range is from 80°F (26.7°C) in December to 82°F (27.8°C) in February through June (Fisher 1964;Table 75). However, temperatures do change rapidly with elevation; about 1°C for each 200 m elevation (Lekagul and McNeely 1977:XVIII). Frosts are common in highlands in the northern part of the area and snow falls on the highest peaks. The coolness at higher elevations creates local convection currents which bring additional rain to highlands and these areas may have markedly more rain than adjacent lowlands.

Soils in mainland Southeast Asia can, with the exception of the extremely dry interior of Burma, be divided into two major groups (Spencer and Thomas 1971:Figure 10.1). Alluvial soils are found in the broad lowlands of the great rivers and in smaller areas along some coastal lowlands. These recently developed soils are fertile and are very important agriculturally. The other major group of soils lie above flood regimes and are formed by interaction of the various parent materials with the warm, moist climate (Dobby 1960:74-82; Butzer 1971:136-139). The high heat (and concomitant lack of frost activity), and plentiful, though seasonal, rainfall greatly increases the relative importance of clays and silts in soil development. The process of laterization is also an important soil process in the area. Laterization is the downward leaching of certain soluble minerals, particularly iron compounds, which forms a hardpan

layer in soils. Laterite is a useful building material since it is typically soft in the ground and hardens irreversibly when exposed to air. The concentration of iron can be high enough to make laterite a source of iron ore (Brown et al. 1951:72; Fisher 1964:51).

A profuse variety of flora and fauna are found in mainland Southeast Asia. The whole area is within the Oriental zoogeographic region except for some of its northern margins (Lekagul and McNeely 1977: Figure 14). Some of the larger mammals which are endemic to the Oriental region are gibbons, the Slow Loris, langurs, the Malayan Sun Bear, the Clouded Leopard, several civets, the Javan and Sumatran Rhinoceros, the Asiatic Elephant, the Mouse Deer or Chevrotain, and the wild Water Buffalo (Lekagul and McNeely 1977:XXXIII-XL). Two main zoographic subregions pertain to mainland Southeast Asia. The Indochinese subregion covers most of the area except for the southern Malay Peninsula (southern Thailand and Malaya) which is included in the Sundaic subregion (Lekagul and McNeely 1977:Figure 15). The two subregions are basically defined by the presence of particular species of small mammals (Lekagul and McNeely 1977:XL-XLII). There are two main forest types in the area (Fisher 1964:45-46; Lekagul and McNeely 1977:XXII-XXVII). Evergreen forests predominate where rainfall is high and/or relatively evenly distributed between seasons. These are dense, multiple-canopy forests with very tall trees, an

understory of smaller trees, and a tangled undergrowth including numerous vines. Deciduous forests are found where rainfall is less and the dry season long. These forests are more open than the evergreen forest and the undergrowth is typically very dense.

Regions of Laos, Cambodia, and Upper Thailand

Comparative archaeological data in Chapter 6 is drawn from an area encompassing Laos, Cambodia, and "upper Thailand" (ie. Thailand excluding the southern peninsula). The geography of the major regions in this area are described here (Figure 2-1). For this purpose, Laos and Cambodia are considered to be regions and upper Thailand is divided into Central, North and Northeast Thailand.

Laos

Most of Laos is rugged highlands of the Annamite Cordillera (Figure 2-1). The mountain ranges reach over 9000 feet (2744 m) in northern Laos and are somewhat less further south (Spencer and Thomas 1971:145). While there are some highland plateaus, overall the Laotian highlands are among the most rugged and sparsely populated in all of Southeast Asia. Lowland plains are only found along the valley of the Mekong River downstream from the vicinity of Vientiane (or Vientienne). These plains are the main rice growing areas

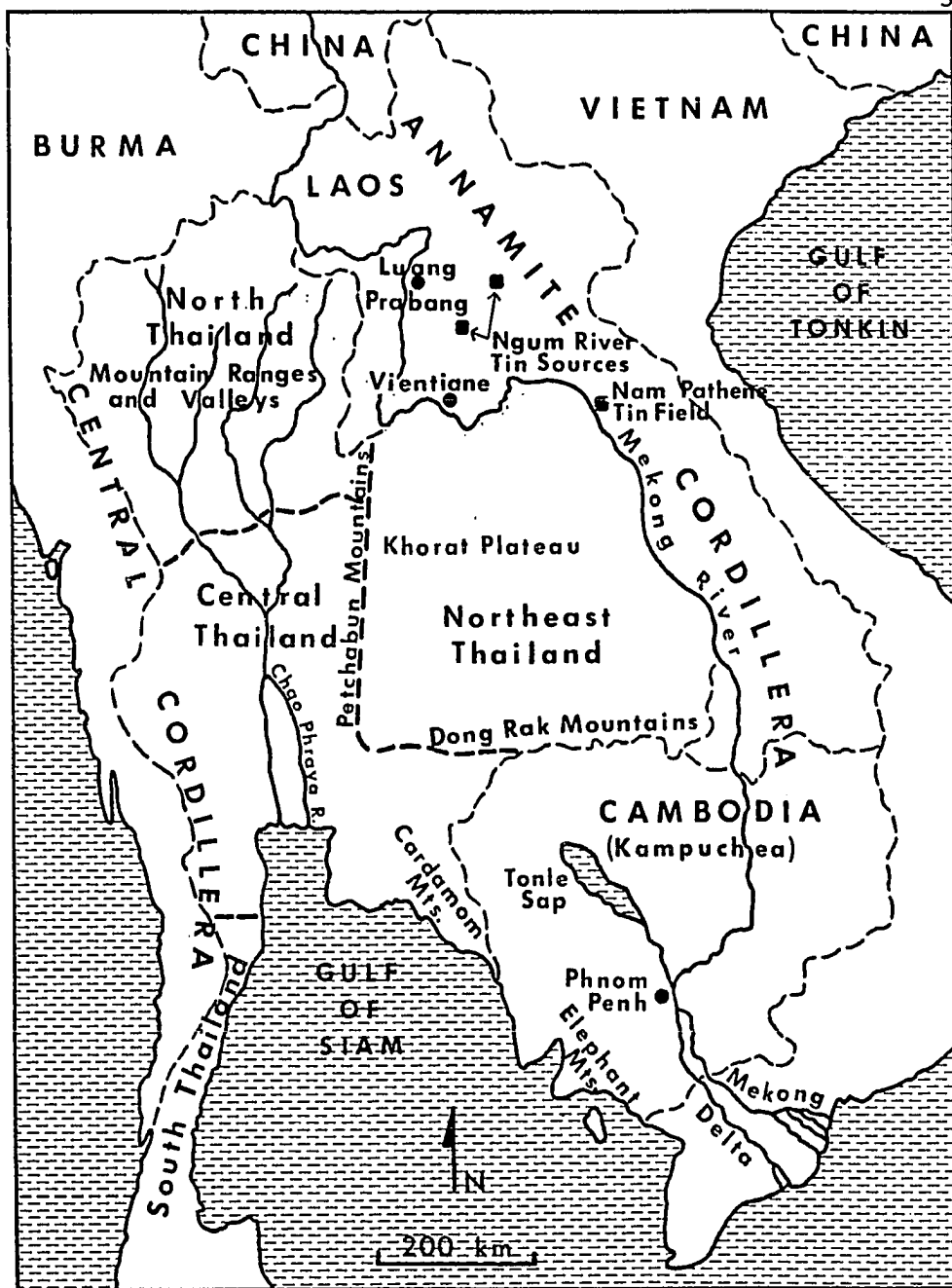


Figure 2-1. Regions of Laos, Cambodia, and upper Thailand.

and population centers of the country (United Nations 1968:57). Limestone formations are found in the north, especially in the area around Luang Prabang, and are extensive in the central part of the country (United Nations 1968:22). Copper and tin sources are found at scattered locations in the country (Workman 1972:Figure 6). The Nam Pathene tinfield in the Mekong valley and the tin sources along the Ngum River can be singled out here for their importance to later discussions of Northeast Thailand (Figure 2-1). Iron sources are present in the north of the country (United Nations 1968:48).

Rainfall in Laos falls mainly during the summer monsoon with some highland areas receiving over 600 mm in July and a yearly total over 3000 mm (Djambatan 1964:47). The mean monthly temperature in Luang Prabang is 20.6°C in January and 28.2°C in July (Djambatan 1964:47). Temperature reports from one cooler highland area (Xieng Khouang, elevation 1149 m) show a mean temperature range from 14.1°C in December to 22.5°C in June (United Nations 1968:7).

Most of Laos is covered with shallow, undifferentiated soils associated with the rugged terrain (United Nations 1968:52). Important alluvial soils are found only in a few relatively small areas scattered along the Mekong valley. The remaining areas are covered by a variety of soils according to local topography, climate and parent materials.

Laos is mostly forested with a mix of evergreen and deciduous forest types (Djambatan 1964:47). The fauna is mainly of the Indochinese subregion although, interestingly, the cool highlands of the north are in effect an "island" of Palearctic fauna which are more typically found in lands to the north (Lekagul and McNeely 1977:XLIII).

Cambodia

The area described as the Cambodian Saucer by Spencer and Thomas (1971:147) roughly corresponds to the political boundaries of Cambodia (Figure 2-1). The saucer is rimmed with mountains; on the west by the Cardamon and Elephant Mountains, on the north by the Dong Rak Mountains (discussed below with Northeast Thailand), and on the east by the southward extension of the Annamite Cordillera. At the heart of the region is the Tonle Sap (Great Lake). The Tonle Sap is annually flooded by backflow from the Mekong River. The connecting river reverses its flow when the Mekong is in full flood and the Tonle Sap fills to cover as much as 4000 square miles (Dobby 1960:301). Limestone formations are relatively few in Cambodia and are found scattered across the north (United Nations 1968:22). Copper sources are found in northeast Cambodia and tin in the south (Workman 1972:Figure 6). Iron sources are common across northern Cambodia (United Nations 1968:48).

Cambodia receives its major rainfall in summer (Djambatan 1964:47). Much of the lowlands around the Tonle Sap are a rainshadow area which receive only about 125-200 mm of rain in July and a yearly total between 1000 and 1500 mm. The mountains in the southwest are very rainy, however, with some areas receiving some rain in the January, over 600 mm in July, and a yearly total over 4000 mm. Mean monthly temperatures in Phnom Penh are 25.8°C in January and 27.7°C in July (Djambatan 1964:47).

Alluvial soils are common in Cambodia (United Nations 1968:52). The major alluvial formations are the lower valley and upper delta of the Mekong River, and the floodplain and tributary streams of the Tonle Sap. The other soils are a patchwork resulting from local topography, climate and parent materials. Cambodian forests are a mix of evergreen and deciduous types (Djambatan 1964:47) and the fauna is wholly within the Indochinese subregion (Lekagul and McNeely 1977:Figure 14)

Central Thailand

The heart of Central Thailand (Figure 2-1) is the great central plain of the Menam Chao Phraya (Chao Phraya River). These broad alluvial lowlands are the most extensive rice-growing area of Thailand. The plain is bordered on the west by mountains of the Central Cordillera. The Cardamon Mountains are in the southeast. The Petchabun Mountains form

the eastern border of the region, and are discussed below with Northeast Thailand. Limestone formations are extensive along both the east and west sides of the region (United Nations 1968:22). Copper and tin sources are both present in Central Thailand (Workman 1972:Figure 6). The copper is mainly along the eastern side of the region while tin is found in the west and southeast. Iron ore sources are scattered around the region (United Nations 1968:48).

The Chao Phraya plain is a rainshadow area in which some areas receive less than 1000 mm of rain per year (Djambatan 1964:42). The mountains of the southeast are rainy, as described above for the adjacent mountains of southwest Cambodia. Again, the heaviest rains are during the summer monsoon. January temperatures range from about 24-27°C across the region, while July temperatures range from 25°C in the rainy southeast to 29°C in the central lowlands (Djambatan 1964:42).

Alluvial soils are extensive along the Chao Phraya valley (United Nations 1968:52). A variety of other soils are found according to local conditions. Most of the central plain is now cultivated (Djambatan 1964:42): extant forests are tropical evergreen in the rainy southeast, and a mixture of evergreen and deciduous types along the other mountainous margins. The fauna is of the Indochinese subregion (Lekagul and McNeely 1977:Figure 14).

North Thailand

North Thailand is a mountainous region (Figure 2-1). The topography is generally characterized by a series of roughly parallel, north-south mountain ranges. In the terminology of Donner (1978:Figure 120), these are, from west to east, the Doi Inthanon Range, the Khun Tan Chain, the Phi Phan Nam Mountains, and the Luang Prabang Range. In and between these mountain ranges lie the valleys of the main tributaries of the Chao Phraya River. These are, from west to east, the Ping, Wang, Yom and Nan Rivers. Limestone formations are extensive, especially in the western part of the region (United Nations 1968:22). Copper, tin, and iron sources are present in the region (Workman 1972:Figure 6; United Nations 1968:48).

North Thailand receives most of its rain in the summer (Djambatan 1964:42). It is not a very rainy region, however, with no area receiving more than 2000 mm per year. Although it is a mountainous region, it is too far inland to receive much rain during the monsoon season. Temperatures can be quite cool, averaging below 20°C in the far north in January (Djambatan 1964:42). July temperatures range from 26° to 28°C across the region.

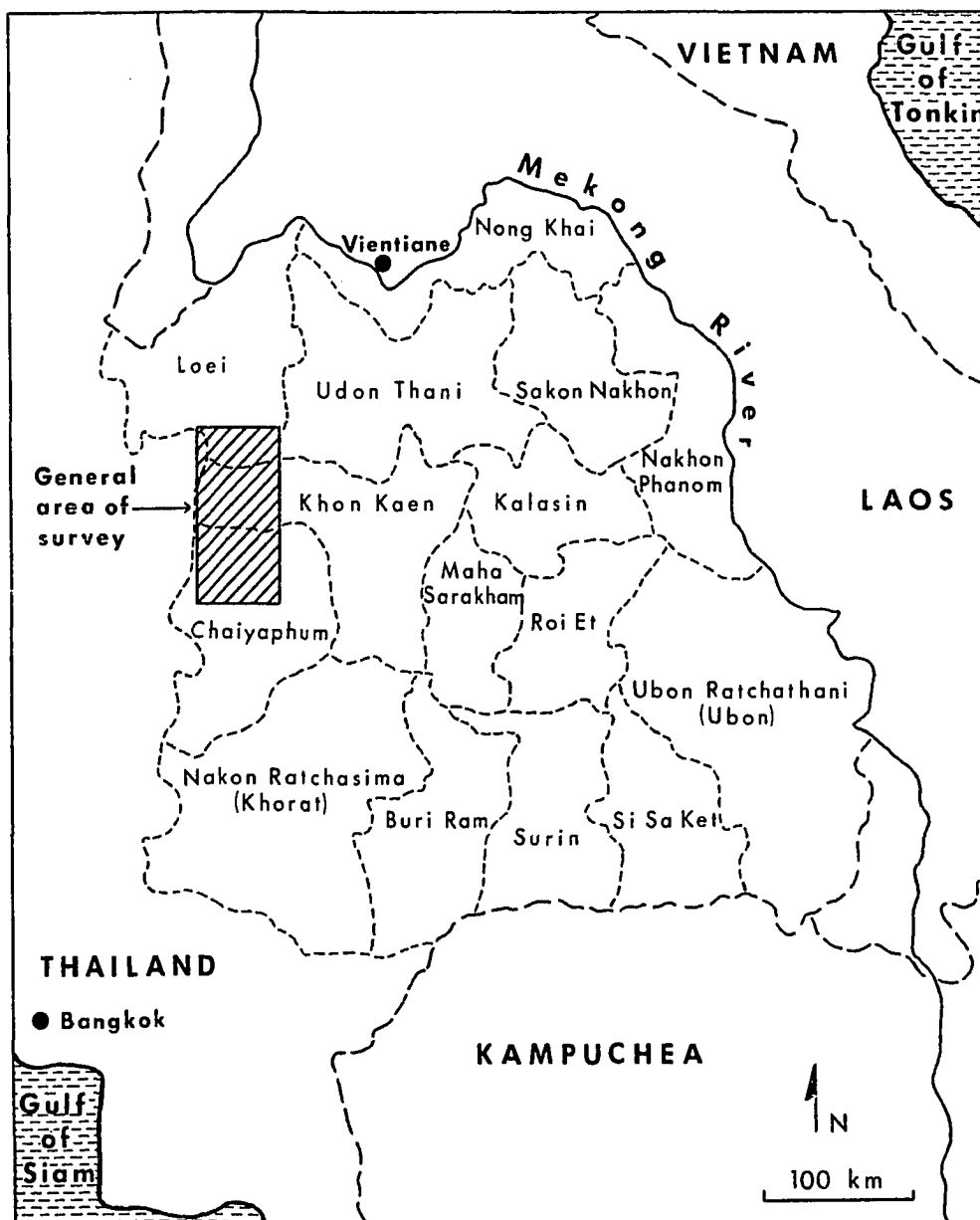
Alluvial soils are limited to a few areas along river valleys (United Nations 1968:52). The most extensive other soils are the shallow, undifferentiated soils associated with the mountain ranges. Uncultivated land is covered with

a mixture of evergreen and deciduous forests, and some small areas of pine forest (Djambatan 1964:42). The fauna is generally within the Indochinese subregion. However, like northern Laos, the cool highlands are islands of Palearctic fauna (Lekagul and McNeely 1977:XLIII).

Northeast Thailand

Northeast Thailand comprises 15 provinces (Figure 2-2). Topographically, the principal feature of the region is the Khorat Plateau (Figure 2-3). The plateau is essentially a peneplain (Haworth et al. 1966:48) which is now tilted by the uplifting of the mountains along its western and southern edges. The western border of the plateau is formed by the Petchabun Mountains and the southern border is the Dong Rak Mountains. The Khorat Plateau is not very high; average elevation is approximately 200 m along the western margins and generally less than 150 m along the Mekong River which forms the northern and eastern borders of the region. However, the relatively slight difference in elevation marks a distinct difference in geology. The Khorat Plateau is the only extensive plain in Southeast Asia which is not alluvial.

The Khorat Plateau is constructed of successive strata of Ratburi Formation limestones of Carboniferous/Permian age and a series of sandstone/shale/siltstone formations; the Phu Kradung Formation of the Triassic/Jurassic, the Phu Phan



- Provincial boundary
- International boundary

Figure 2-2. Northeast Thailand: political.

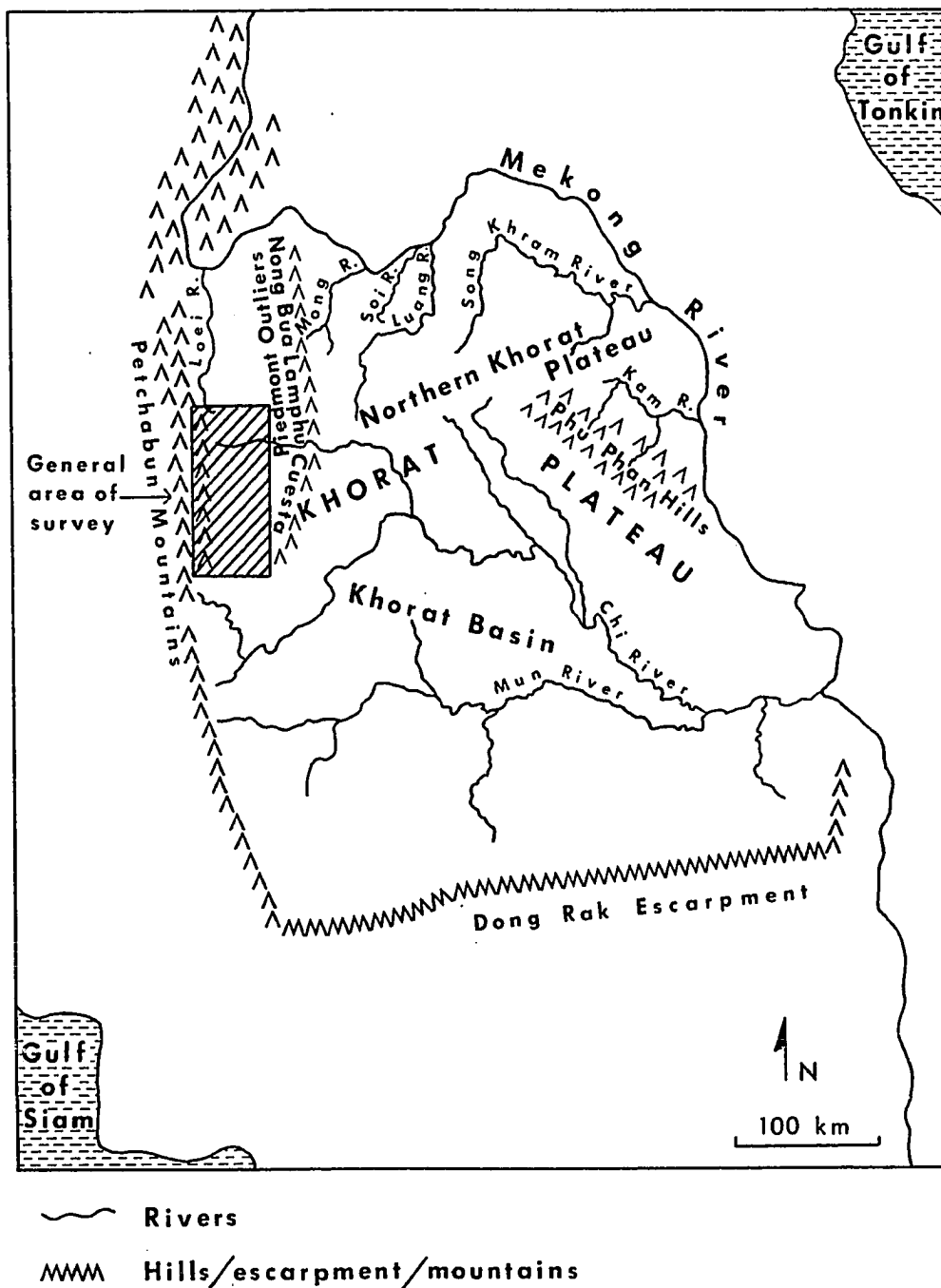


Figure 2-3. Northeast Thailand: topographic.

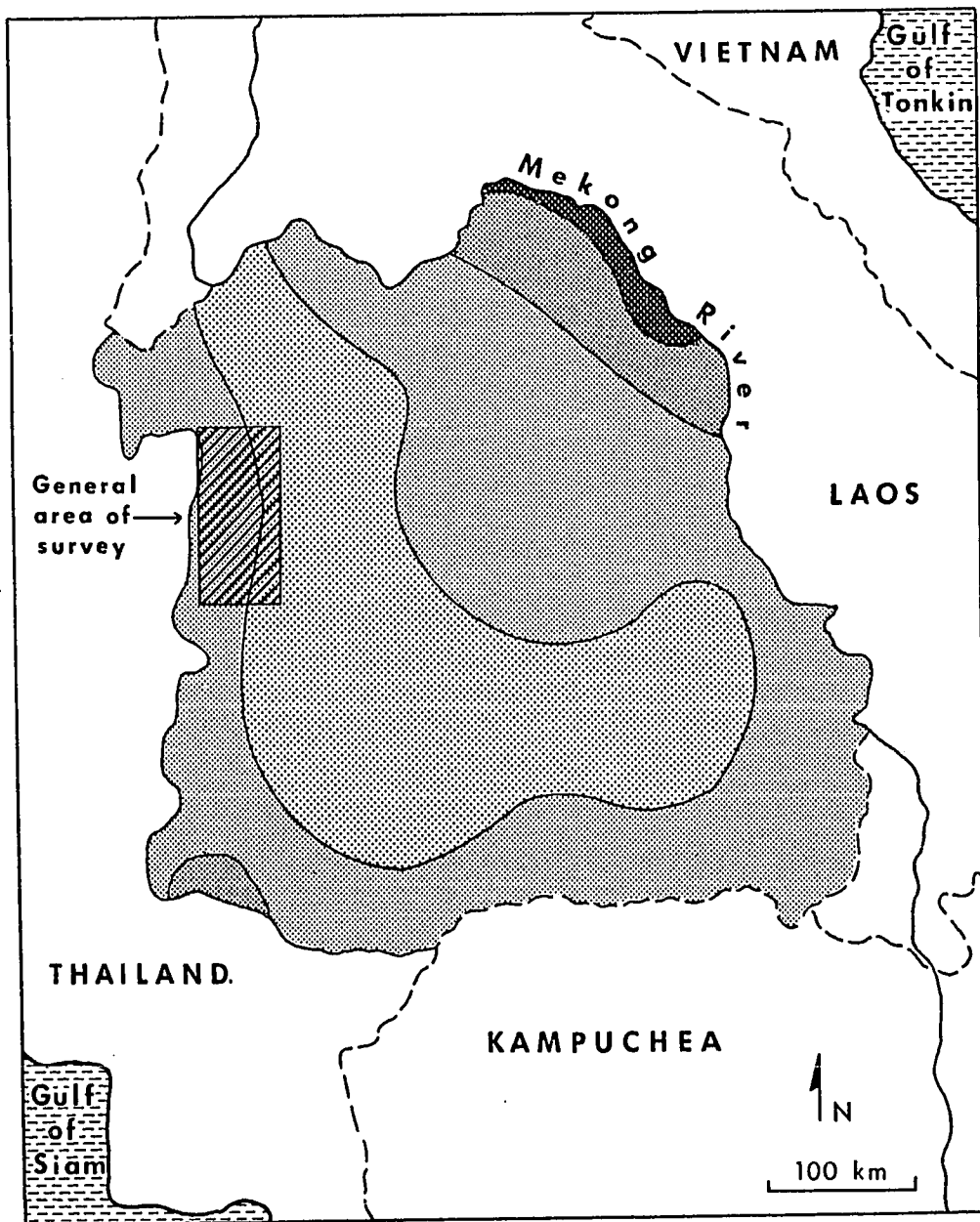
and Phra Wihan Formation of the Jurassic, and the Salt and Khok Kruat Formation of the Cretaceous (Department of Mineral Resources 1969). The youngest deposits, the Salt and Khok Kruat Formation, are widespread over the broad plains of the plateau. The older underlying deposits are exposed in hills and mountainous margins of the plateau (Department of Mineral Resources 1969; LaMoreaux et al. 1959:16 and Figure 4). Exposures of Ratburi Formation limestones form karst highlands which may rise several hundred meters above the adjacent plateau. Quaternary and recent geological activity has created deposits of alluvium, eluvium, valley fill, and river gravel in valleys. Some basalts of Tertiary age have been deposited in scattered areas along the western and southern boundaries of the plateau.

Copper, and copper indications, are found in the region in Loei Province in the northwest and in western Khorat Province in the southwest (Angkatavanich 1975; Workman 1972:36-39). Tin sources are not known in Northeast Thailand, but a source is known in Laos just across the Mekong River, at the Nam Pathene tinfield (Figure 2-1). Sources in Laos along the Ngum River may also have been accessible (Figure 2-1). Tin sources are also present in other surrounding regions (see above), but were probably inaccessible due to intervening mountains. Iron sources are

present in Loei Province in the northwest corner of the region (United Nations 1968:48).

The Khorat Plateau has extensive deposits of salt which may have been important in prehistory. Salt from deposits in the Salt and Krok Kruat Formation is available on or near the surface over broad areas of the plateau (United Nations 1968:48; Haworth et al. 1966:Plate 13). Traditional salt production on the plateau is described in detail by Haworth et al. (1966:179-191). Archaeological excavations have demonstrated that salt production extends back at least 2-3000 years (Higham and Parker 1970:16; Kijngam et al. 1980:128). Extensive salt deposits are not present in Laos, Cambodia, Central Thailand, or North Thailand.

The rainfall pattern for Northeast Thailand is shown in Figure 2-4. In general, the region is a dry, rain shadow area as the result of the surrounding mountains. Rainfall increases in the northeast corner of the region as the result of southwest (summer) monsoon winds beginning their ascent into the high mountains of adjoining Laos. The seasonality of rainfall at three stations in the region is shown in Figure 2-5 (see Figure 2-2 for province locations). Seasonality is also shown in Figure 2-6 which plots rainfall in relation to evaporation and clearly shows the dry months in which evaporation exceeds rainfall. Northeast Thailand experiences a mild yearly temperature cycle. Mean monthly temperatures across the plateau range from 28.6° to 30.1°C



Mean annual precipitation (mm)

1000-1250

1875-2500

1250-1875

2500-3750

— International boundary

Figure 2-4. Rainfall pattern for Northeast Thailand (adapted from United Nations 1968:14).

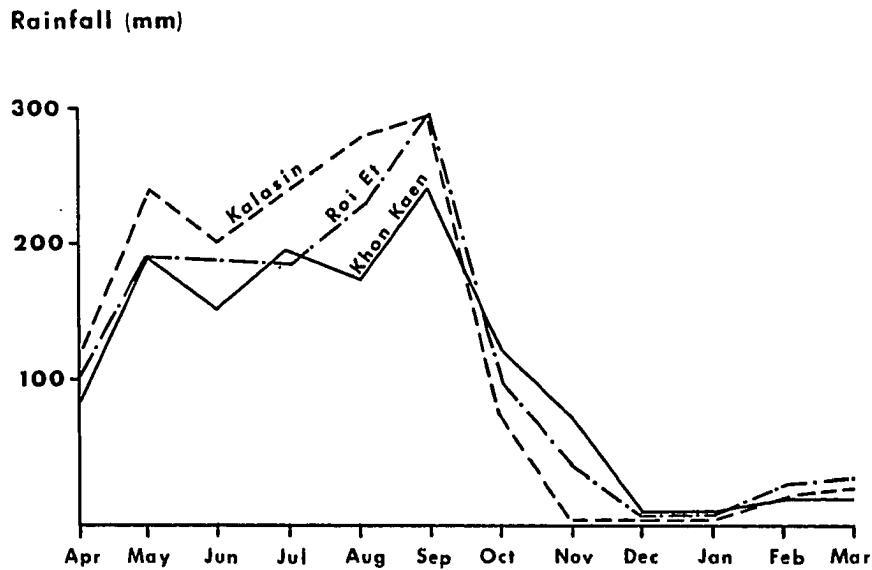


Figure 2-5. Rainfall by month for three stations in Northeast Thailand (adapted from LaMoreaux et al. 1959:Figure 2)

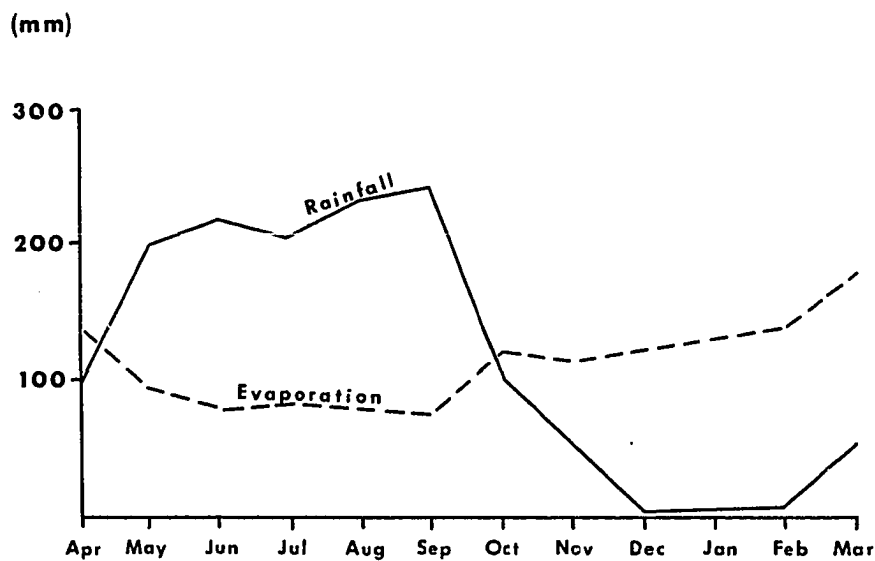


Figure 2-6. Rainfall and evaporation at Udon Thani (adapted from LaMoreaux et al. 1959:Figure 3).

in April and from 21.3° to 23.7°C in December and January (United Nations 1968:11).

Alluvial soils on the Khorat Plateau are normally only found in river valleys. The lower courses of the main rivers (Mun and Chi) do have fairly extensive areas of alluvial soils due, in part, to the fact that flooding is extensive when drainage is inhibited by high flood waters of the Mekong River. Most of the surface of the plateau is covered with mature soils, principally Gray Podzolic and Red-Yellow Podzolic soils in uplands, and Low-Humic Gley soils which usually form on poorly drained lowlands such as stream terraces (Moorman and Rojanasoonthon 1972).

The most extensive forest in Northeast Thailand in prehistoric times was the Dry Dipterocarp type of deciduous forest (Lekagul and McNeely 1977:XXVII). These forests predominate on dry plains and substantial areas are still present (Lekagul and McNeely 1977:XVI). The Mixed Deciduous forest type is found in slightly wetter areas of the plains, and on lower slopes and rainshadow microclimates in mountainous areas (Lekagul and McNeely 1977:XXV-XXVII). Evergreen forests are very limited in the region, being confined to the higher and wetter zones of the mountainous borderlands (Lekagul and McNeely 1977:XXIII-XXV). The fauna is of the Indochinese subregion (Lekagul and McNeely 1977:Figure 15).

Northeast Thailand Subregions

Khorat Basin

The Khorat Plateau (Figure 2-3) is divided topographically by a watershed running from the Phu Phan hills west across the northern part of the plateau (Haworth et al. 1966:47-49). South of this watershed, the Khorat Basin drains approximately 80% of the plateau. This basin is formed by the extensive Mun and Chi River system which flows into the Mekong River at the southeastern corner of the plateau. The Salt and Krok Kruat Formation is extensive in the subregion with Quaternary alluvial formations along the river system and some Tertiary basalts along the southern margin (Department of Mineral Resources 1969). The subregion is generally devoid of metal ore sources (Workman 1972; Ankatavanich 1975; United Nations 1968:48). However, salt formations are widespread (United Nations 1968:48; Haworth et al. 1966:Plate 13). The Khorat Basin encompasses some of the driest areas of Northeast Thailand (Figure 2-4), but has some of the most extensive wet rice areas in the region due to the flooding along the lower Mun and Chi Rivers (see above). Low Humic Gley soils are extensive in the subregion with Gray Podzolic soils typical of uplands (Moorman and Rojanasoonthon 1972). Dry Dipterocarp (deciduous) forest is extensive in the basin and provides

good habitat for large grazing animals under certain local conditions (Lekagul and McNeely 1977:XVI).

Northern Khorat Plateau

North of the Khorat Basin watershed, a series of smaller rivers (Mong, Soi, Luang, Songkhram and Kam) drain into the Mekong along the northern and northeastern borders of the Khorat Plateau (Figure 2-3). This northern area of the plateau has been termed the Sakon Nakon Basin (Haworth et al. 1966:5; Donner 1978:554). However, this terminology is confusing. If restricted to the Songkhram River drainage, it does not describe the entire area, while if it includes several of the river drainages, there seems to be no justification for calling the area a basin. The term Northern Khorat Plateau is preferred in this report. Surface geology is mainly Salt and Khok Kruat Formation with some Quaternary alluvial deposits along the Mekong and some of the smaller rivers (Department of Mineral Resources 1969). Like the Khorat Basin, this subregion does not contain known metal ore sources, but salt is available across a large part of the area (Workman 1972; Angkatavanich 1975; United Nations 1968:48; Haworth et al. 1966:Plate 13). Rainfall is quite variable: the west end of the subregion is very dry and the east, particularly the northeast corner, is favored with more rain (Figure 2-4). Alluvial soils are rare, Low Humic Gley soils are extensive, and Red-Yellow Podzolic

soils are typical of uplands (Moorman and Rojanasoonthon 1972). Dry Dipterocarp forests are extensive in the subregion with Mixed Deciduous and Dry Evergreen forests appearing in the rainier northeast corner (Lekagul and McNeely 1977:XVI).

Dong Rak Mountains

The southern border of the Khorat Plateau is formed by the Dong Rak Mountains (Figure 2-3). These are relatively low mountains, averaging 500 m and ranging up to 700 m in elevation. They are, however, quite rugged. This range is often referred to as an escarpment since it does represent the transition from the Khorat Plateau to the lower alluvial plains in central Cambodia. Phu Phan and Phra Wihan Formation rock make up most of the mountain range (Department of Mineral Resources 1969). This subregion is generally lacking in mineral resources (Workman 1972; Angkatavanich 1975; United Nations 1968:48; Haworth et al. 1966:Plate 13). Copper sources at the west end of these mountains are considered below with the Petchabun Mountains. The highlands are generally somewhat cooler and moister than the adjacent plains (Figure 2-4). Soils are mainly complexes related to the rugged relief (Moorman and Rojanasoonthon 1972). Mixed Deciduous and Dry Evergreen forests are found in the subregion (Lekagul and McNeely 1977:XVI).

Petchabun Mountains

The western border of the Khorat Plateau is formed by the Petchabun Mountains (Figure 2-3). These are higher than the Dong Rak Mountains and range over 1500 m in elevation. Rising as they do from a plateau of only some 200 m, they represent quite dramatic relief. Geologically, these mountains are complex with the relief exposing the various formations which underlie the adjacent plateau (see above). Some volcanic activity is represented and the northern end of the range is even more complex with exposures of rock not found out on the plateau (Department of Mineral Resources 1969). Upper elevations in the mountains are typically cooler and moister than the adjacent plain (Figure 2-4). Soils are mainly complexes associated with the rugged terrain, although flat-topped mountains have fairly extensive areas of Red-Yellow Podzolic soils (Moorman and Rojanasoonthon 1972). A variety of forests are present and are distributed according to the increases in rainfall and coolness at higher elevations (Lekagul and McNeely 1977:XVI). Mixed Deciduous forests are found on lower slopes, and Dry Evergreen, Hill Evergreen and Coniferous forests at higher elevations.

Petchabun Piedmont Subregions

The Petchabun Piedmont is not a zone defined by geographers. This piedmont is not a broad area and is not included in the generalized geographical schemes reflected in the preceding subregions. In order to describe the piedmont, two subregions are defined and discussed here (Figure 2-3).

1. The Petchabun Piedmont proper (hereafter referred to simply as the Petchabun Piedmont) is the narrow zone where the relatively level plain meets the main mountain range.

2. The Piedmont Outliers include the lowlying land containing monadnocks of sandstone and limestone east to and including the Nong Bua Lamphu cuesta.

Definition of these two subregions clarifies both the topographical situation and a problem in the use of the term "piedmont" in the literature reviewed in Chapter 1. Topographically, the two subregions describe the abrupt descent of the Petchabun Mountains to a relatively level plain and the fact that the plain is studded with highlands isolated from the main range. In the literature, Gorman (see page 23) clearly uses the term piedmont in relation to a zone at the foot of a mountain range. However, Higham (see page 22) uses the same term to refer to Non Nok Tha which is between two of the monadnocks in the Piedmont Outliers. It will be recognized that the Petchabun Piedmont

research area described in the following section was specifically selected to follow Gorman's usage. A separate description of the Piedmont Outliers is not provided because the same general environmental descriptions apply.

The Petchabun Piedmont Research Area

Traveling west across the Khorat Plateau toward the research area (Figure 2-3) the flat plains are first broken by the hills of the Nong Bua Lampu cuesta. Past these hills, the land is flat again but is no longer an unbroken plain. Isolated hills and mountains jut up here and there. Finally, a unbroken wall of mountains lies in front and the research area is reached. Two major landforms can be discerned both in the isolated monadnocks and the mountain range. These are the rugged, strangely shaped crags of karst formation in the Ratburi Formation limestones, and the flat-topped and smooth-sided mountains of the sandstone formations. A brief description of the local geological formations are provided below, and their distribution in each survey square is shown in figures in Chapter 3.

The Ratburi Formation consists of "Massive light gray limestone interbedded with shale, sandstone, mudstone, conglomerate, and volcanic tuff" (Department of Mineral Resources 1969). Although relatively rare on the Khorat Plateau, this formation is extensive within the survey area. The distinctive karst formations were quite easy to

recognize in the field. Nearly all of the rock shelters or caves investigated during the survey were in this formation. In the survey area this formation is found both as extensive ranges and as isolated outcrops.

The Phu Kradung Formation is "Predominantly dark brown, grayish brown, red micaceous shale with some siltstone, micaceous sandstone, and conglomerate" (Department of Mineral Resources 1969). This is the dominant formation of most of the lower elevation terrain within the survey area. Overlying this formation is the Phu Phan and Phra Wihan formation consisting of "Yellowish gray to grayish pink massive sandstone and conglomerate and grayish red to olive gray to white massive sandstone with dark reddish brown micaceous shale and grayish red micaceous siltstone" (Department of Mineral Resources 1969). Within the survey area, this formation appears in isolated areas as the upper parts of mountains such as Phu Kradung (see Figure 3-1). Together, the Phu Phan and Phra Wihan, and the Phu Kradung formations form a distinctive cuesta topography of sloping plateau and steep face. Due to the relative resistance of the various components, these monadnocks have a characteristic bell shaped profile for which, presumably, Phu Kradung ("Bell Mountain") is named. These formations are referred to in the text as sandstone formations in order to simplify reference.

Several members of these geological formations are potentially important as sources of raw materials. Some data of specific interest in the research area are described here along with resources of general interest which have been included in previous discussions. In terms of sheer volume, the most important source of raw materials is the local sandstone formations. At Non Nok Tha (in the Piedmont Outlier zone) these sandstones have been used for grinding stones, hammerstones, casting molds, and pigment grinders. Ferruginous siltstone, presumably from these same formations, was used as a red pigment (Bayard 1971b:33-34).

Sources of cherty material suitable for the manufacture of adzes and other similar stone tools is a more difficult problem. Some chert material is associated with the Phu Kradung Formation (Department of Mineral Resources 1969:8) and was observed during the survey. Other types of stone used in adze manufacture at Non Nok Tha are fine-grained metamorphic rocks (phyllite or quartzite) and igneous diorites or granodiorites (Bayard 1971b:35). Sources for these rocks were not identified in this survey, but some sources are likely to be found in local or nearby geological formations. Quartzite boulders are associated with the basal Phu Kradung Formation (LaMoreaux et al. 1959:Table 1). Granodiorites of Triassic age are exposed in Loei Province (Department of Mineral Resources 1969). Little is known of regional sources of stone suitable for flaked or ground

stone tools, but the general impression is that they are rare and of relatively poor quality when compared with other areas of the world.

This western margin of Northeast Thailand is rich in metal ores. Copper has been found both north of the actual survey area in Loei Province and south in western Khorat Province (Angkatavanich 1975; Workman 1972:36-39). A copper indication at a location higher in the mountains along the area surveyed is described by Workman (1972:39 and Figure 6) and raises the possibility that a source of copper may have been present in the survey area. As described above, tin sources are not found in Northeast Thailand but are in all surrounding regions. High grade iron ores are found in Loei Province (United Nations 1968:41 and 48). However, iron may have also been available in widespread laterite formations (Brown et al. 1951:72; Fisher 1964:51).

Saline soil in minor amounts was observed in the survey area. These "salt licks" are, and probably were, important in hunting. This salt may have been sufficient for minimal human consumption (see Bernatzik and Bernatzik 1958:139). However, it seems that quantities of salt, for example that required to preserve fish paste (Bayard 1971b:37), must have been obtained from out on the plateau (see above).

In the absence of weather stations, the climate of the survey area can be assumed to represent the variety described above for the Khorat Plateau and the Petchabun

Mountains. Soil complexes on steep lands are frequent in the research area along with a mix of soils found on the plateau (Low-Humic Gley, Gray Podzolic and Red-Yellow Podzolic soils). Red-Brown Earths are also important in the research area since they typically derive from limestones such as the Ratburi Formation exposures (Moorman and Rajanasoonthon 1972). Detailed soil maps were available for three of the provinces in which work was conducted (Soil Survey Division 1973a, 1973b, 1975). Soil maps for each of the survey grid squares are in Appendix A.

Forests in the research area represent a wide variety as the result of the relief. Dry Dipterocarp forest pertains to the dry plains, and the somewhat wetter Mixed Deciduous forest is found along the lower slopes and fringes of the mountains (Lekagul and McNeely 1977:XXXV-XXVII). Dry Evergreen forest is common on the higher and wetter slopes of the mountains (Lekagul and McNeely 1977:XXIII). Hill Evergreen forest represents a still higher and cooler variety of evergreen forest (Lekagul and McNeely 1977:XXIV). Distribution of this forest type is generally limited to the high interior of the mountain range but is known to be present on the plateau of Phu Kradung (see Figure 3-1) within the research area (Tsutsumi 1964:94 and Table 1). Fire-climax coniferous forest is also present on Phu Kradung (Lekagul and McNeely 1977:XXV). Some other habitats which can be briefly described for the research area are the lime-

stone crags which have unique vegetation due to the permeability of the rock, swampy grassland which may have been the natural vegetation of some of the present ricelands, and bamboo which was probably mixed with other forest types prior to regular burning (Lekagul and McNeely 1977:XXVII-XXIX). Streams, lakes and swamps are also important resource areas.

In order to describe the various environmental variables, data was recorded for each site following two schemes.

1. A list of five variables was made following the sampling strata devised by Schauffler (1976). These are;

- a) rainfall zones (see Figure 2-4),
- b) presence or absence of permanent water supply,
- c) surface geological formations as described above,
- d) soil types from provincial soil maps, and
- e) topography expressed in terms of elevation.

2. The location of a site was described in terms of a modified version of the environmental zones described by Bayard (1971b:42-54) for a piedmont outlier zone. The zonation scheme is summarized in Table 2-1. See Bayard (1971b:42-54) and Higham (1975b:4-5) for details of each zone. Zones 1-6 were generally followed as described. However, some slight changes in names were made, including renaming "uplands" as "terrancelands". This avoids confusion

 Table 2-1. Modified environmental zone model.

Modified Model		Bayard Model	
<u>Zone No.</u>	<u>Zone Name</u>	<u>Zone No.</u>	<u>Zone Name</u>
1	River Bottomlands	1	River Bottomlands
2	Ricelands		Ricelands
3	Terracelands	3	Uplands
4	Foothills	4	Foothill Forest
5	Mountainsides	5	Mountainside Forest
6	Mountaintops	6	Mountaintop Forest
-	---	7	Villages
8	Limestone Highlands	-	---

caused by the fact that "uplands" as described by Bayard are, in fact, a lowland landform. For general reference, lowlands comprise zones 1-3 and highlands include zones 4-6 and 8. Bayard makes a good point in including villages (zone 7) in his list. However, the fact that present villages contain important resources is not relevant to description of the location of a prehistoric site and this zone is not used in the modified scheme. Sites in present villages are referred to the environmental zone in which the village lies. Zone 8 was added to account for the limestone outcrops which are found in the research area but not in the locality described by Bayard.

Summary

As described in detail in this chapter, the research area is along the piedmont of the Petchabun Mountains in Northeast Thailand. This setting is near the heart of

mainland Southeast Asia. The rich variety of the environment held the promise of interesting archaeological survey work which is described in the next chapter.

CHAPTER THREE

SURVEY

Introduction

The first task in the field was to conduct a systematic survey of the Petchabun Piedmont. As described in detail in Chapter 1, one of the major goals was to gather data to test the proposition that such a piedmont zone would contain sites representing the transition between the Hoabinhian and village farming complexes. Other goals were to develop a cultural sequence for the surveyed area, to record environmental variables systematically, and to search for possible copper and stone resources. How the piedmont area was sampled and how the archaeological survey fieldwork was conducted are described in the following section.

Survey Methodology

The first major consideration was to reduce the surveyed area systematically to a manageable size. The sample was based on a selection of 10 x 10 km grid squares of the Universal Transverse Mercator (UTM) system which appears on 1:50,000 topographic maps and 1:250,000 air maps. Following Redman (1974:17), the sample was conceived as a

systematic transect sample. This was in the form of alternate east west rows of grid squares down the length of the intended survey area. In each row, squares which included mountain/foothill topography on the eastern fringe of the mountains were selected. The number of squares selected in each row varied from one to five depending on the lay of the land at that latitude. The squares actually surveyed (Figure 3-1) represent a modified version of the original survey design as described below.

The sampling scheme fills a number of theoretical and practical requirements for the survey. The UTM grid squares were practical sampling units since they were readily available and relatively easy to define in the field. Also, a similar grid system was employed by Schauffler (1976) in the stratified, random sample which he initiated in 1975 for the Northeast Thailand Archaeological Project. Thus, the sample units from this survey could be directly integrated into the larger sampling scheme of the parent project (see below). The Petchabun Piedmont is long north to south, and narrow east to west. The zone is also bordered on the west by mountains and on the east by low plains of the Piedmont Outliers (see Chapter 2). The selection of alternate east-west grid rows (transects) provided a systematic sample of manageable size by reducing the surveyed area on the long axis of the sample universe, while providing transects from the mountains out to the plains.

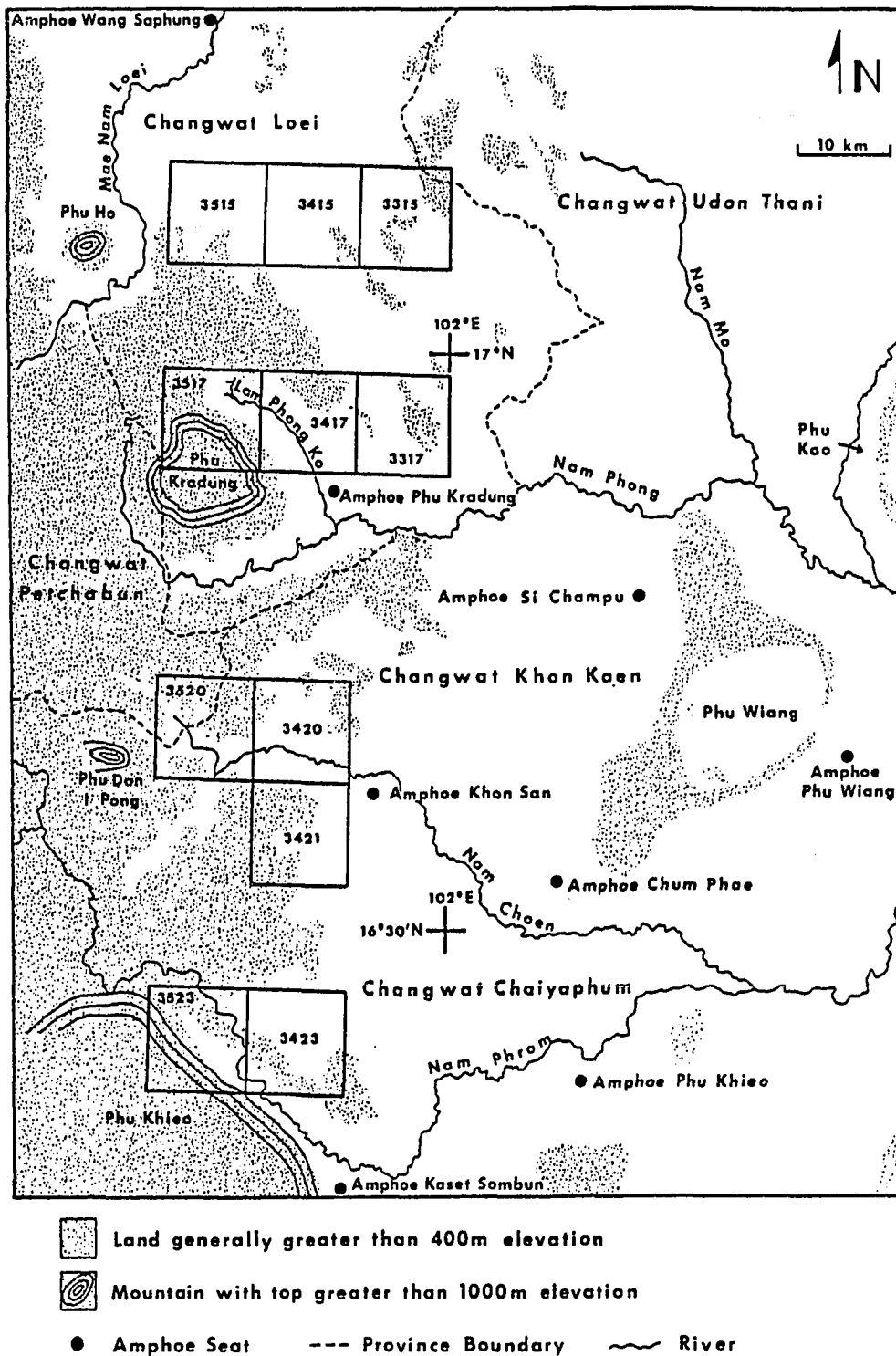


Figure 3-1. Petchabun Piedmont Survey grid squares.

The grid numbering system of this survey was coordinated with that of Schauffler's survey (above). Each survey square was assigned a four-digit number. The first two digits are the sequential number of the square counting west from the northeastern corner of Northeast Thailand. The second two digits are a similar sequential number counting south (ie. corresponding to the grid rows of this sample). For example, Square 3315 (Figure 3-1) is the thirty-third square west and the fifteenth square south of the northeastern corner of Northeast Thailand. Square 3315 can also be described as the easternmost square in Row 15 of this survey.

The final selection of grid squares illustrated in Figure 3-1 represents a reduced and modified version of the original survey plan. The reduction in coverage came when it was learned in the field that the second season of the Pa Mong Project (Bayard n.d., 1980b) had extended their survey to include the valley of the Loei River as far south as Amphoe Wang Saphung, Changwat Loei. Thus, the northern rows of the intended survey area were truncated, along with the two western-most squares in Row 15 (3615 and 3715). This was a welcome modification since survey coverage (albeit with a different sampling scheme) was provided even further north than planned while reducing the workload of this survey. The squares selected in Row 19 had to be eliminated because they had no villages (see below). Squares in Row 18

could not be substituted because villages in the valley south of Phu Kradung were controlled by communist guerillas. Therefore, Squares 3520 and 3420 were substituted. The final selection comprised eleven 10 x 10 km grid squares, ie. 1100 km². Systematic work was confined to these squares but any data observed in incidental activities was also recorded. The actual area covered in survey was somewhat less than the total of the squares due to vagaries in survey coverage detailed below.

The approach to survey within the grid squares was based on two major considerations. First, in order to attain the theoretical goals of the survey, it was only necessary to demonstrate the presence/absence of certain kinds of sites (see Chapter 1). Therefore, there was no imperative to perform an intense survey directed to obtaining quantitative results. Second, the survey was designed to cover a relatively large area in which the ground cover was almost always very dense. The survey was, therefore, based on village by village informant contacts, a method which has proven expeditious in locating sites under similar survey conditions (see Solheim and Gorman 1966:114-115).

The survey party consisted of myself, my wife, Duangkheo Phiramol, and Lung Li. Duangkheo acted as interpreter and general guide. Although the two Americans were able to get along in the Thai language, the work of making contacts with officials and villagers required an expertise

beyond our language capabilities at this early stage of fieldwork. Making these contacts was very important since, as detailed below, the success of the survey was largely dependent on the good will of both officials and villagers. Duangkheo also had the very important job of determining if a particular village was safe to enter. The survey area included some territories controlled by communist guerillas. Lung Li was originally brought along merely to watch the survey camps, but he proved to be a very valuable team member. While the other three team members were out looking for sites, Lung Li fielded innumerable questions about our work and generated much good will for the project by his explanations. Lung Li also proved to be a valuable source of information on plants and animals, and later worked on an ethnobotanical project for Joyce White (1982b).

Prior to actually entering the field, some formalities were observed. Our formal papers from the Thai Ministry of Education (the ministry which includes the Fine Arts Department) and the Thai National Research Council were taken on a courtesy call to the governor of each of the provinces in which survey was conducted. In turn, a letter of introduction was taken to the district officer in each of the districts in which we worked. In each village, the headman was contacted first and the formal letters were presented along with an explanation of our purpose. With the headman's help, or at least permission, the surveyors

contacted as many villagers as possible asking them for any observations of potential archaeological interest.

Information from these interviews was recorded on index cards listing date, village, informant, description of information, and any miscellaneous notes. This system of recording provided a convenient filing system for keeping track of leads which were of major importance to this work, those of lesser or no interest, and some leads which referred to areas outside of our survey grid squares. The latter group compiled into a list for investigation by our Thai Fine Arts Department colleagues. The survey team professed a disinterest in Buddhist era artifacts and sites. This allowed the survey work to focus more closely on prehistoric periods and avoided confrontations with people who believed that the true purpose of our work was to loot Buddhist artifacts. Historic sites which were investigated were fully recorded. Field notes were also kept during the survey interview work. Artifacts which were shown to us during interviews were recorded under the index card system, and descriptions, sketches, and photographs were made.

All major leads, and as many minor ones as possible, were investigated. A guide, usually the informant, accompanied the survey team to the location of each potential site and a search for evidence was made by the survey team. Each recorded site was assigned a number based on the Thai national system for numbering administrative

units (Royal Thai Survey Department 1976). A two-digit number representing the changwat (province) is followed by a period and a two-digit number representing the amphoe, (district) and then followed by a hyphen and a consecutive number for each site within that area. For example, 17.09-15 was the fifteenth site recorded in Amphoe Phu Kradung, Changwat Loei. Each numbered site was formally recorded as to location, archaeology, and environment. Detailed descriptions of the survey sites discussed in this volume are presented in Appendix B. Collected artifacts were bagged and entered in the bag log. Photographs and sketches supplemented the recording. Incidental archaeological information was recorded in field notes.

Usually, the guide was able to take the survey team to the location of the lead and it was enough to search the area for information on a possible site. Field conditions were usually such that collections were of an unsystematic, opportunistic nature. Systematic surface sampling was impossible because of dense ground cover. Surface collections normally covered areas of erosion or digging by the local people. Where the surface sample was large, some control was instituted by picking up everything within a 1 x 1 m square located in an area where the ground surface was exposed. This, at least, insured that small items would be included in the sample. Information on the extent of a site was likewise normally incomplete. In some extreme cases,

surface collection was totally impossible and small "cat hole" excavations were necessary to confirm a deposit. Cave sites were normally easy to define and collect.

The Coe and Flannery field definition of a site was used in this survey.

To us, a site is any archaeological feature, such as a sherd concentration on the surface of the ground, or an artificial mound, sufficiently isolated from other manifestations to suggest that it was anciently the location of either a discrete community, albeit only a hamlet, or a ceremonial center of some sort. (Coe and Flannery 1967:84)

However, in practical terms, this definition is difficult to apply to ephemeral sites. In this survey, a single jar burial was considered to be a site while a single stone tool was considered to be a stray find. Given this clarification, the definition generally worked well in the field. It was sometimes difficult to separate earlier historic occupation from the present occupation of a village. Another difficult case which occurred with some frequency was that of pottery or other artifacts found in caves with no archaeological deposit. These objects were recorded as stray finds. Although they could have been seen as "cache sites," it did not seem to be efficient to record them fully as sites.

Survey Results

A total of 45 sites were recorded in the course of survey endeavors within the eleven grid squares (Table 3-1).

Table 3-1. Survey sites by grid square.

<u>Grid Square</u>	<u>Site Number</u>	<u>Site Name</u>
3315	17.09-15	Thay Yay Sam Bon
	17.09-16	Tham Miang
	17.09-18	Ban Kaw (Ban Phoem)
	17.09-19	Ray Sombun
	17.09-21	Tham Pha Ya
3415	17.09-13	Tham Wua Daeng
	17.09-14	Tham Maholan
	17.09-22	Stone Monument
3515	17.09-23	Ban Puan Phu
	17.09-24	Taw Paw Nga
	17.09-25	Ray Ampha
3317	17.09-11	Tham Pha Khong
	17.09-12	Ray Chaliaw
	17.09-26	Tahm Kway Daeng
3417	17.09-2	Jar Burial 1
	17.09-3	Ban I Loet
	17.09-4	Jar Burial 2
	17.09-5	Ban Si Tha Wan 1
	17.09-6	Ban Si Tha Wan 2
	17.09-7	Non Noy
	17.09-8	Non Thon
	17.09-9	Na Phi Ton
	17.09-1	Ray Saw
3517	17.09-10	Ray Sida
3420	22.01-4	Non Taw Lek
	22.01-5	Ban Nong Heo
	22.01-7	Ban Song Khon
	22.01-8	Tham Nong Kha
	22.01-10	Tham Phra (Ban Thakabu)
	22.01-11	Tham Mup
	31.01-1	Wat Phosi
	31.01-2	Nong Ta Wang
	31.01-3	Ban Noy
	31.01-5	Ban Huai Khi Tom
3520	16.01-1	Huai Fai Mai
	22.01-3	Tham Tewada
	31.01-11	Non Khaw Wong
	31.01-12	Tham Lay
3421	31.01-6	Tham Rup
	31.01-7	Tham Ngam Mong Kham
	31.01-8	Tham Mup
	31.01-9	Ray Phun
	31.01-10	Tham Phra (Ban Nam Un)
3423	31.03-1	Ban Nong Hai
	31.03-2	Ray Kham
3523	-	-

Detailed records of these sites are provided in Appendix B. Here, each survey square is considered, beginning with those in the northernmost row. The location and environment of each square is briefly described, along with details of the survey effort and a summary of the finds. Reading of these survey descriptions will be enhanced by reference to Table 3-2 which is a glossary of Thai words which frequently appear in place names.

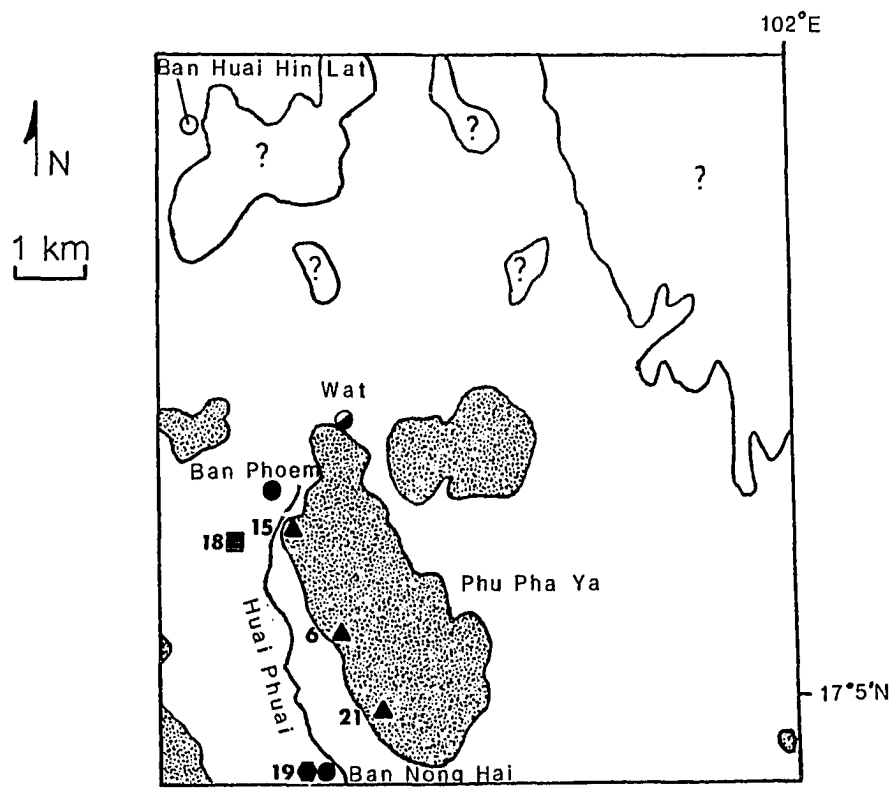
Square 3315











This survey grid square is the easternmost square in row 15 (Figure 3-1). The sites investigated in all the squares in this row are in Amphoe Phu Kradung, Changwat Loei (17.09). Exploration of this grid square (Figure 3-2) was, in fact, limited to the southwestern quarter of the square in Ban Phoem, Ban Nong Hai, and a wat (temple) on the north of Phu Pha Ya. Ban Huai Hin Lat was not surveyed since it is in Amphoe Wang Saphung and this survey did not obtain permission to survey there. The eastern half of the square had no villages and the villagers interviewed could not give detailed information on that area.

Topographically, the square is comprised of low rolling land between 310 and 350 m elevation, and studded with limestone outcrops (Figure 3-2). The outcrops include Phu Pha Ya which has a maximum elevation of 575 m, highest in the square. The conspicuous geology of the area is the

Table 3-2. Glossary of common Thai place name words.

<u>Thai</u>	<u>English</u>
<u>Amphoe</u>	District
<u>Ban</u>	Village
<u>Changwat</u>	Province
<u>Huai</u>	Stream, often intermittent
<u>Lam</u>	River, usually small
<u>Mae Nam</u>	River, usually large
<u>Na</u>	Wet rice paddy
<u>Nam</u>	River, i.e. short for <u>Mae Nam</u>
<u>Non</u>	Mound
<u>Phu</u>	Mountain
<u>Ray</u>	Dry crop field
<u>Taw Paw</u>	Smelting furnace
<u>Tham</u>	Cave, rock shelter
<u>Wat</u>	Buddhist temple



-  Limestone outcrop: Ratburi Formation
 -  Lowland: Ratburi Formation and others
 -  Geologically unidentified highland
 -  Perennial Stream
 -  Village surveyed
 -  Other survey center
 -  Village not surveyed
 -  Open site
 -  Cave/Rockshelter site
 -  Other site
- All sites prefixed with 17.09

Sources: Haworth et al. (1966:Plate 2)
 Javanaphet (1969)
 Soil Survey Division (1975)
 Field Observations

Figure 3-2. Square 3315 topography/geology and survey.

Ratburi Formation limestone outcrops. There is some conflict between geological sources (compare Haworth et al. [1966:Plate 2] and Javanaphet [1969]) which results in unidentified highlands in Figure 3-2. The Huai Phuai is a perennial stream, as far as the survey team could determine. There are some good soils for rice in the square, mainly in the southwest where the survey concentrated (see Figure A-1).

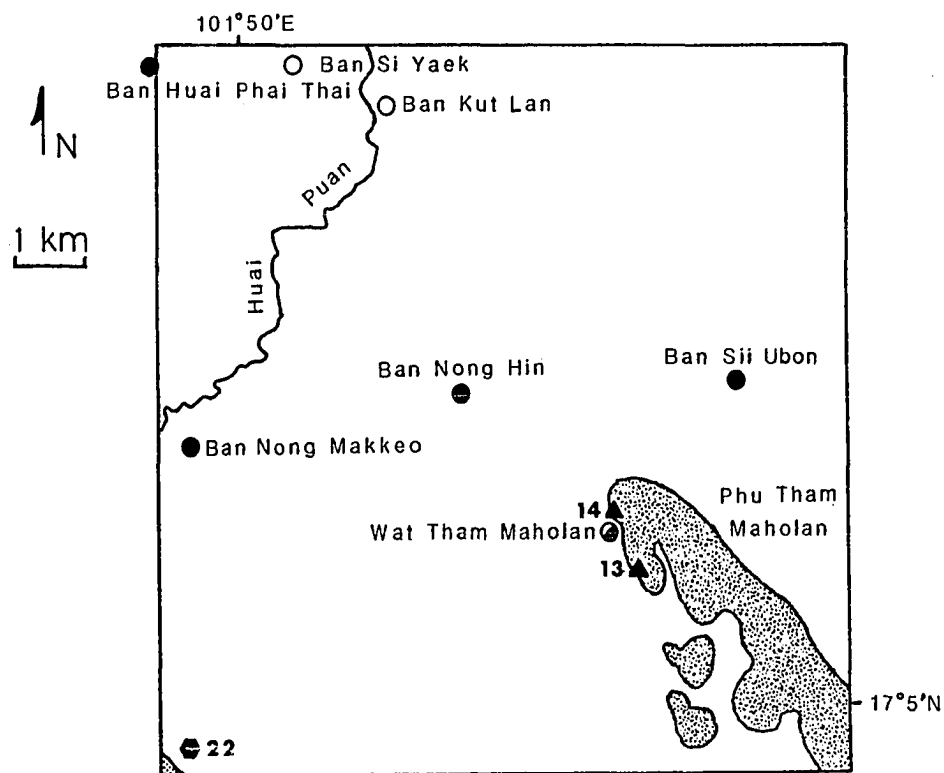
Five sites were recorded in the square (Table 3-1; Figure 3-2). Three were found in caves or rock shelters in the west side of the limestone outcrop Phu Pha Ya. Tham Yay Sam Bon (17.09-15) is a large shelter with a total sheltered area of about 45 x 15 m. The deposit, however, is discontinuous and appeared to be very shallow. Cordmarked and plain earthenware sherds collected from the surface appeared to be prehistoric. Tham Miang (17.09-16) comprised a series of chambers. Only the 5 well-lit outer chambers were investigated. The deposit was shallow and no artifacts were found in a small "probe" excavation. Cordmarked and plain earthenware collected from the surface appeared to be prehistoric. Tham Pha Ya (17.09-21) was a single small chamber (5 x 11 m). Some cordmarked and plain body sherds were found on the surface, but none were found in two probes excavated in the site. The pottery appeared to be prehistoric but the deposit apparently is low in artifact density.











Ban Kaw of Ban Phoem (17.09-18) is an open site which was estimated to cover an oval area of about 75 x 50 m. The site did not rise more than a meter or so above the adjacent paddies. Sherds collected from the surface included porcelain, stoneware and earthenware. Ray Sombun (17.09-19) comprised a scatter of slag and burned clay which were the remains of a single smelting furnace.

Square 3415

This square adjoins the west side of Square 3315 and is the middle of the three squares examined in Row 15 (see Figure 3-1). Survey was conducted in Ban Nong Hin, Ban Nong Makkeo, Ban Si Ubon and Wat Tham Maholan (Figure 3-3). Two villages in the northern portion of the square were in Amphoe Wang Saphung and were not surveyed due to lack of permission to survey in that district. Some coverage in the northwestern area of the square was provided by endeavors in Ban Huai Phai Thai (see Square 3515).

The square is mainly low rolling land between 300 and 330 m elevation (Figure 3-3). In the southeastern quarter of the square is the limestone outcrop Phu Tham Maholan which reaches 615 m elevation. Geologically, the square is transitional between the Ratburi Formation represented by Phu Tham Maholan, and the Phu Kradung Formation represented by the sandstone mountain which just enters the southwest corner of the square. A single large perennial stream, Huai



-  Limestone outcrop: Ratburi Formation
-  Sandstone highland: Phu Kradung Formation
-  Lowland: Ratburi and Phu Kradung Formations
-  Perennial Stream
-  Village surveyed
-  Other survey center
-  Village not surveyed
-  Open site
-  Cave/Rockshelter site
-  Other site

All sites prefixed with 17.09

1. Location of this village is estimated

Sources: Haworth et al. (1966:Plate 2)

Javanaphet (1969)

Soil Survey Division (1975)

Field Observations

Figure 3-3. Square 3415 topography/geology and survey.

Puan, flows through the northwest quarter of the square. Good rice soils are scattered but frequent: they are mainly in the west half of the square (Figure A-2).

Three sites were recorded in this square (Table 3-1; Figure 3-3). Tham Wua Daeng (17.09-13) is mainly noted for the array of paintings executed in red pigment on the rock face of the outcrop (Figure 3-4A). A small, low rockshelter is just to the south of these paintings. Some probable prehistoric pottery was found on the surface of the shelter and another painted figure was found in this area (Figure 3-4B). Tham Maholan (17.09-14) is a very large cave extending an unknown distance into the outcrop. Informants stated that pottery, stone axes, and a human burial were removed during construction of the shrine now occupying the cave entrance. A small fragment of the deposit was intact and bone, but no artifacts, were observed there. The third site (17.09-22) was recorded as a stone monument. The top of the now defaced monument was described as originally having seven carved heads of naga (mythical serpent). There was no evidence of an associated scatter of material. Possibly, the severe erosion in the area removed traces of associated activities.

Square 3515

This square is the westernmost of the three squares investigated in Row 15 (see Figure 3-1). Survey was

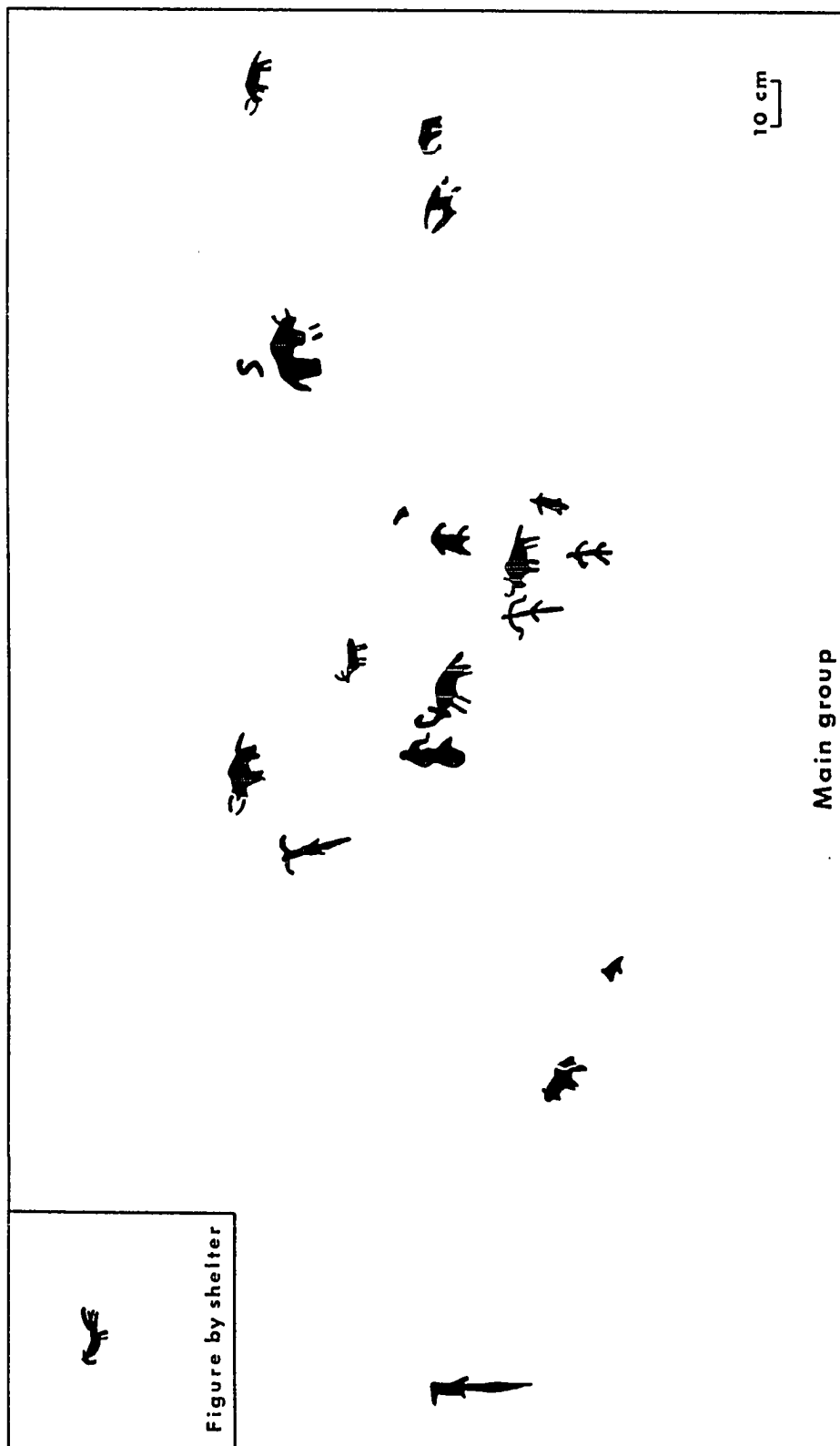
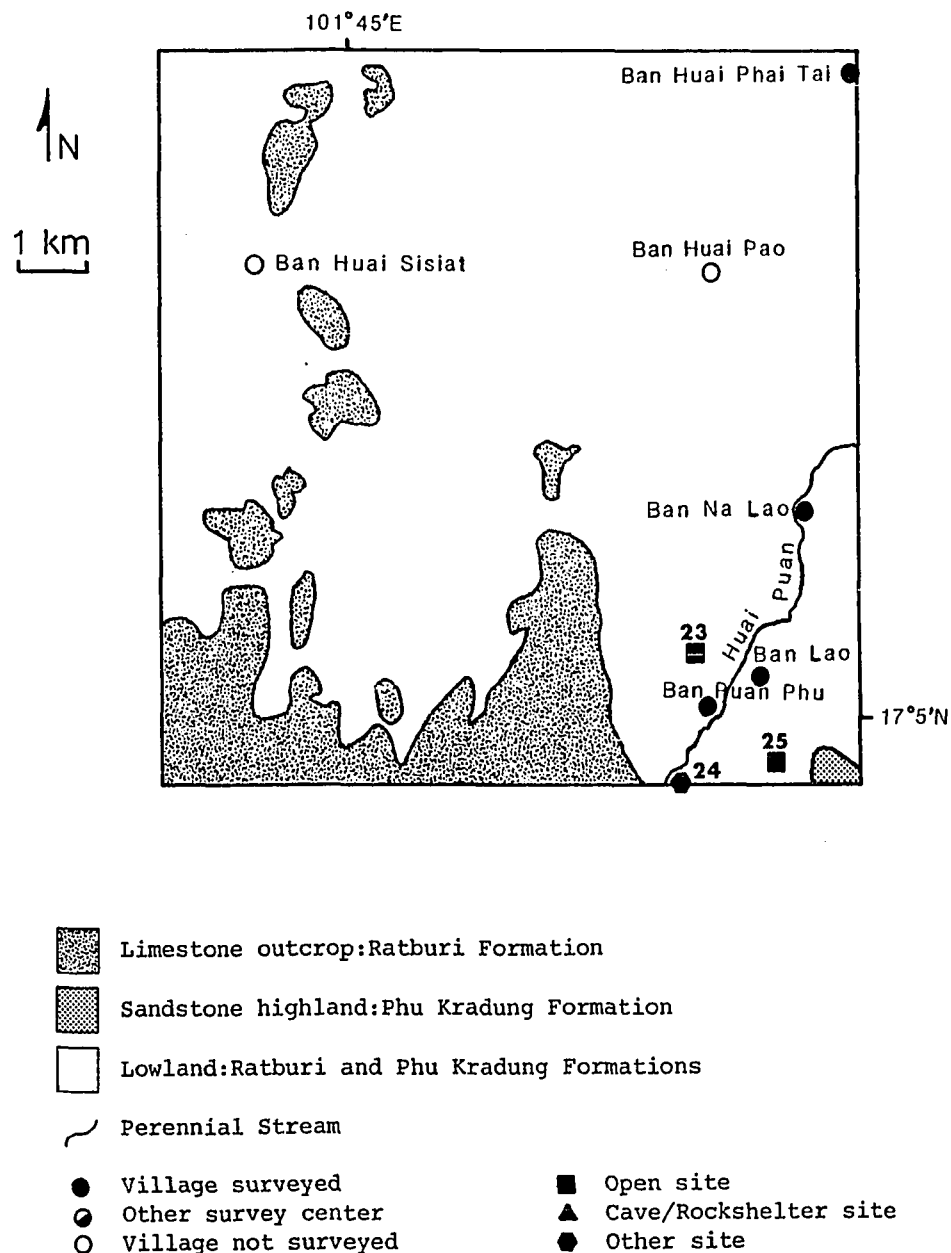


Figure 3-4. Sketch of rock paintings at Tham Wua Daeng.

conducted in Ban Puan Phu, Ban Lao, Ban Na Lao and Ban Huai Phai Thai (Figure 3-5). Ban Huai Pao was not accessible, due to an impassable road, during the period allocated for survey in this area. Ban Huai Sisiat was not surveyed because it was believed to be in an area covered by the Pha Mong Survey. However, the report on that survey (Bayard 1980b) does not list any sites in the vicinity of this village, nor does it mention the village. It may not have been covered.

The square (Figure 3-5) is largely low rolling land between 300 and 370 m elevation. Higher elevations in the square are of two geological types. Massive outcrops of Ratburi Formation limestone reach a maximum elevation of 747 m in the survey square. Just entering the southeastern corner of the square is a ridge of Phu Kradung Formation sandstone. The peak of that ridge is 545 m just outside the square. These sandstone formations reach a maximum elevation of 977 m just south of the square and these mountains figuratively overshadow the area surveyed. A perennial stream, Huai Puan, flows through the southeast quarter of the square and is associated with an extensive area of riceland soils (Figure A-3).

Three sites were recorded in this square (Table 3-1; Figure 3-5). Ban Puan Phu (17.09-23) is an open site estimated to be about 100 m in diameter. Surface collections recovered a large number of prehistoric earthenware



All sites prefixed with 17.09

Sources: Haworth et al. (1966:Plate 2)
 Javanaphet (1969)
 Soil Survey Division (1975)
 Field Observations

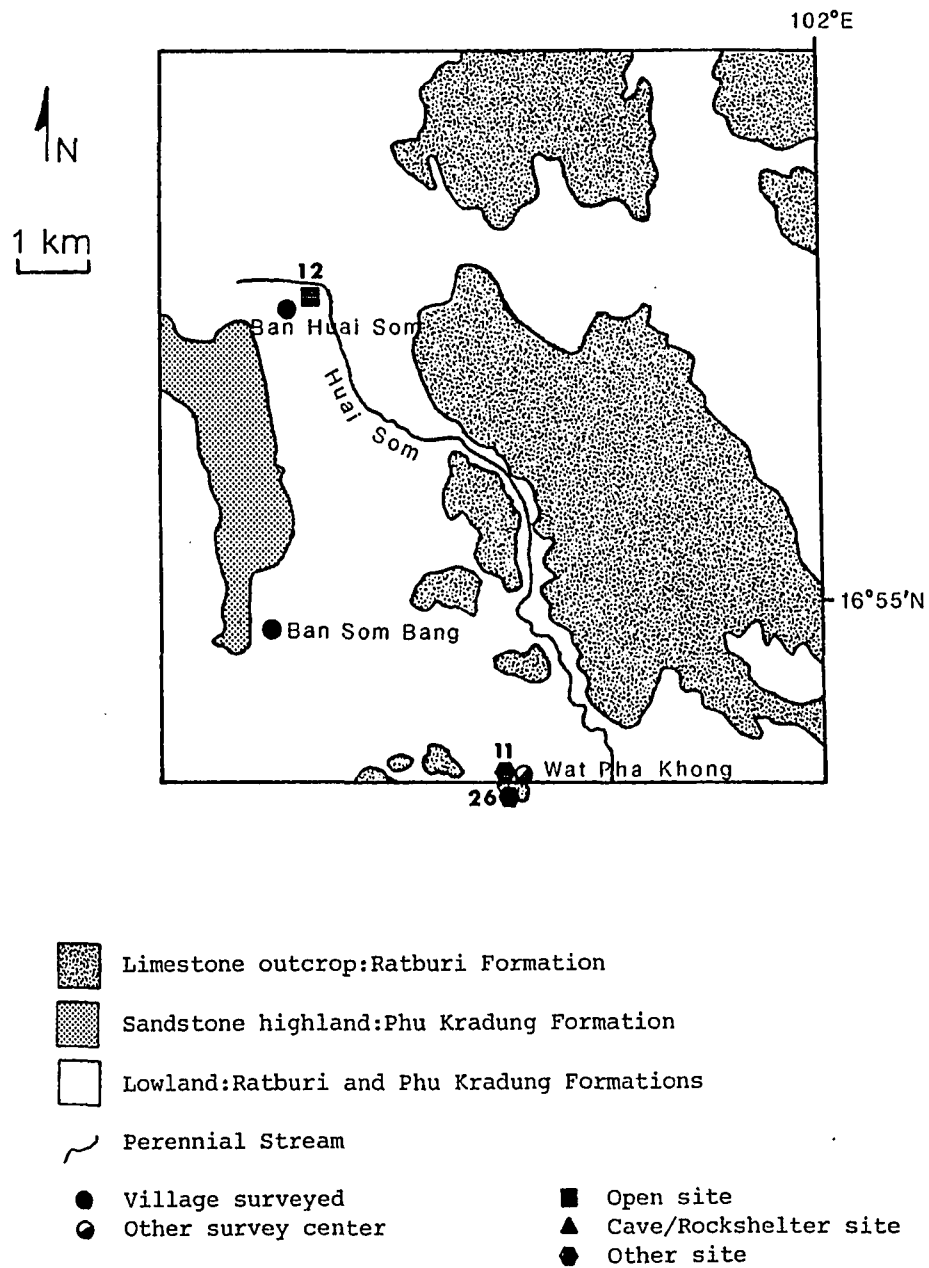
Figure 3-5. Square 3515 topography/geology and survey.

sherds, plus clay pellets, spindle whorls, iron, bronze, beads, slag and bone. This site appeared to be a substantial deposit of some antiquity and was selected for excavation as described in Chapter 4. Ray Ampha (17.09-25) is another open site which included a scatter of prehistoric sherds. The area of this site could not be defined. A burned clay feature was observed on this site. This feature had no associated slag so it could not have been a smelting furnace. The third site, Taw Paw Nga (17.09-24) was described by an informant as a smelting furnace about 3 m in diameter and 2 m high. The furnace was leveled for paddy construction but some slag was recovered in the area.

Square 3317

This square is the easternmost of three survey squares investigated in Row 17 (see Figure 3-1). The area included in this row is within Amphoe Phu Kradung, Changwat Loei (17.09). Survey was conducted in both villages in this square (Ban Huai Som and Ban Sam Bang) and in the outlying Wat Pha Khong (Figure 3-6). However, the villagers interviewed apparently had little knowledge of the unsettled eastern part of the square.

The square is characterized by fairly rugged relief (Figure 3-6). The eastern half of the square is mainly limestone karst terrain with elevations over 400 m very common, and ranging up to 578 m. As in Square 3315, there



All sites prefixed with 17.09

Sources: Haworth et al. (1966: Plate 2)
 Javanaphet (1969)
 Soil Survey Division (1975)
 Field Observations

Figure 3-6. Square 3317 topography/geology and survey.

is conflict between sources as to geological formations in the square. However, it was our observation in the field that all, or at least most, of the highland in question was karst formations attributed to the Ratburi Formation. The sandstone formation on the western side of the square is the extreme eastern end of large formations covered in the following two squares. Here, it is a fairly low ridge attaining an altitude of 486 m. The intervening area is rolling land dissected by streams, at elevations of 260-320 m. Geologically, the square clearly straddles the transition between the Ratburi Formation limestones and the Phu Kradung Formation sandstones. A perennial stream, Huai Som, flows roughly down the middle of the square. There is only one small patch of good paddy rice land in the square (Figure A-4).

Three sites were recorded in the course of survey in this square (Table 3-1; Figure 3-6) (Note that one of these sites [17.09-26] is actually located just outside the square). Ray Chaliaw (17.09-12) is an open site of undetermined size. Stoneware and earthenware sherds, and slag were recovered from the surface.

The other two sites are in rock shelters in the limestone outcrop, Phu Pha Khong, along the southern border of the square. Tham Pha Khong (17.09-11) has a small sheltered area of about 5 x 10 m. The floor of this shelter is rock and apparently collects water in the wet season. A series

of paintings executed in red pigment (Figure 3-7) were found on the southern wall of the shelter. It appeared that more paintings had been present but eroded away. Tham Kway Daeng (17.09-26) also has paintings in red pigment. The man (Figure 3-8A) is on the outer east wall, and the buffalo (Figure 3-8B) is on the ceiling. Hand prints (both right and left) and other markings are also present. Soil deposits were present in the main chamber (ca. 7 m dia.) and in a small antechamber. Some prehistoric sherds were found on the surface (mainly in the antechamber), along with part of a stone "donut" and a piece of possibly worked stone. This site was selected for excavation by Thai team members of the parent project. Their field report in Thai describes excavation of two pits. A 3-m square pit was excavated in the main chamber and yielded 2 sand-tempered sherds and animal bone. A 1-m square pit was excavated in the antechamber and yielded 6 sand-tempered sherds, a stone tool, mollusc shell, and animal bone.

Square 3417

This square is the middle of the three squares investigated in Row 17 (see Figure 3-1). Survey was conducted in all four villages in this square: Ban I Loet, Ban Si Ta Wan, Ban Na Paen, and Ban Nong Tum (Figure 3-9). Moreover, the villagers exhibited a rather intimate knowledge of the

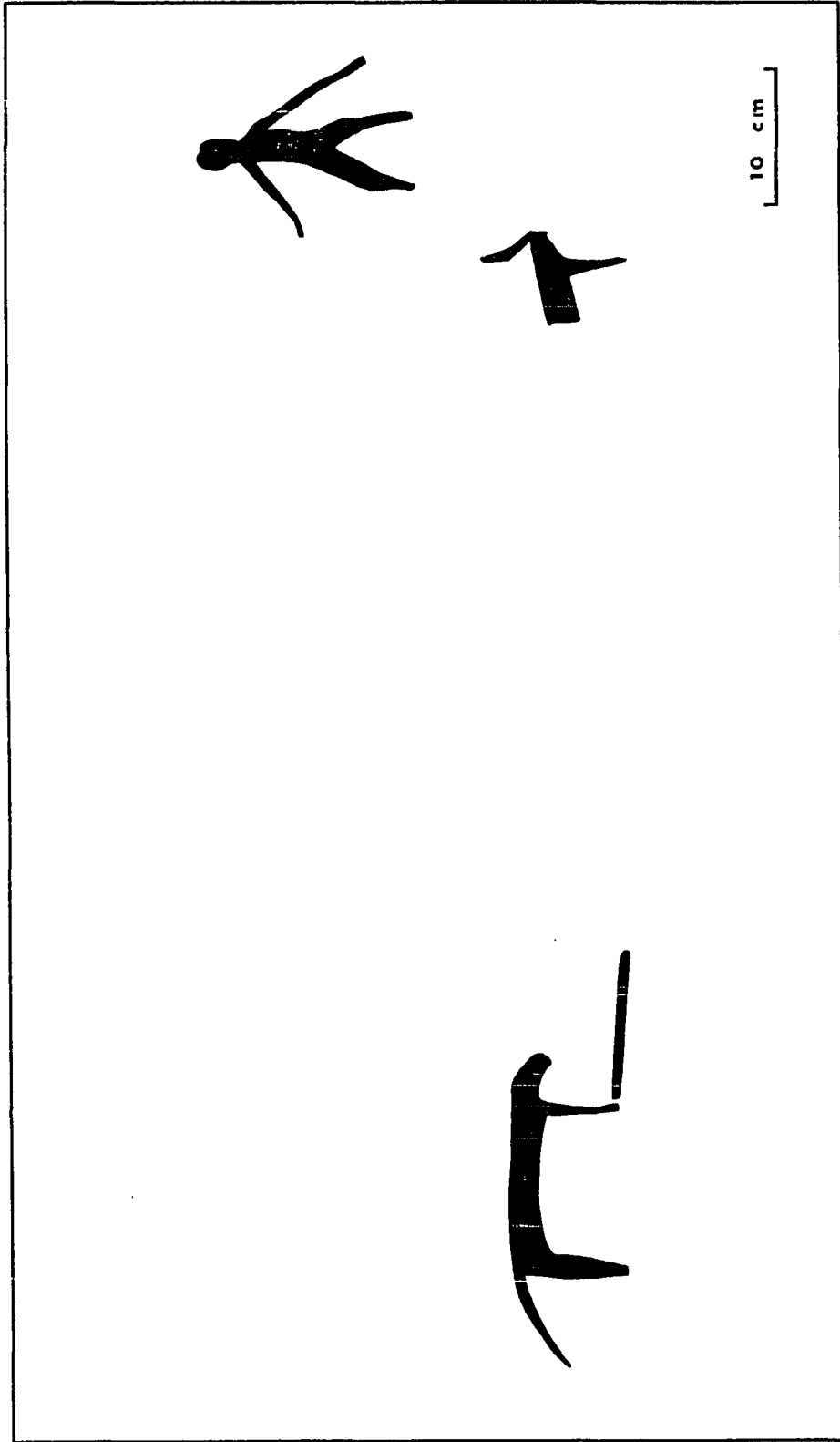


Figure 3-7. Sketch of rock paintings at Tham Pha Khong.

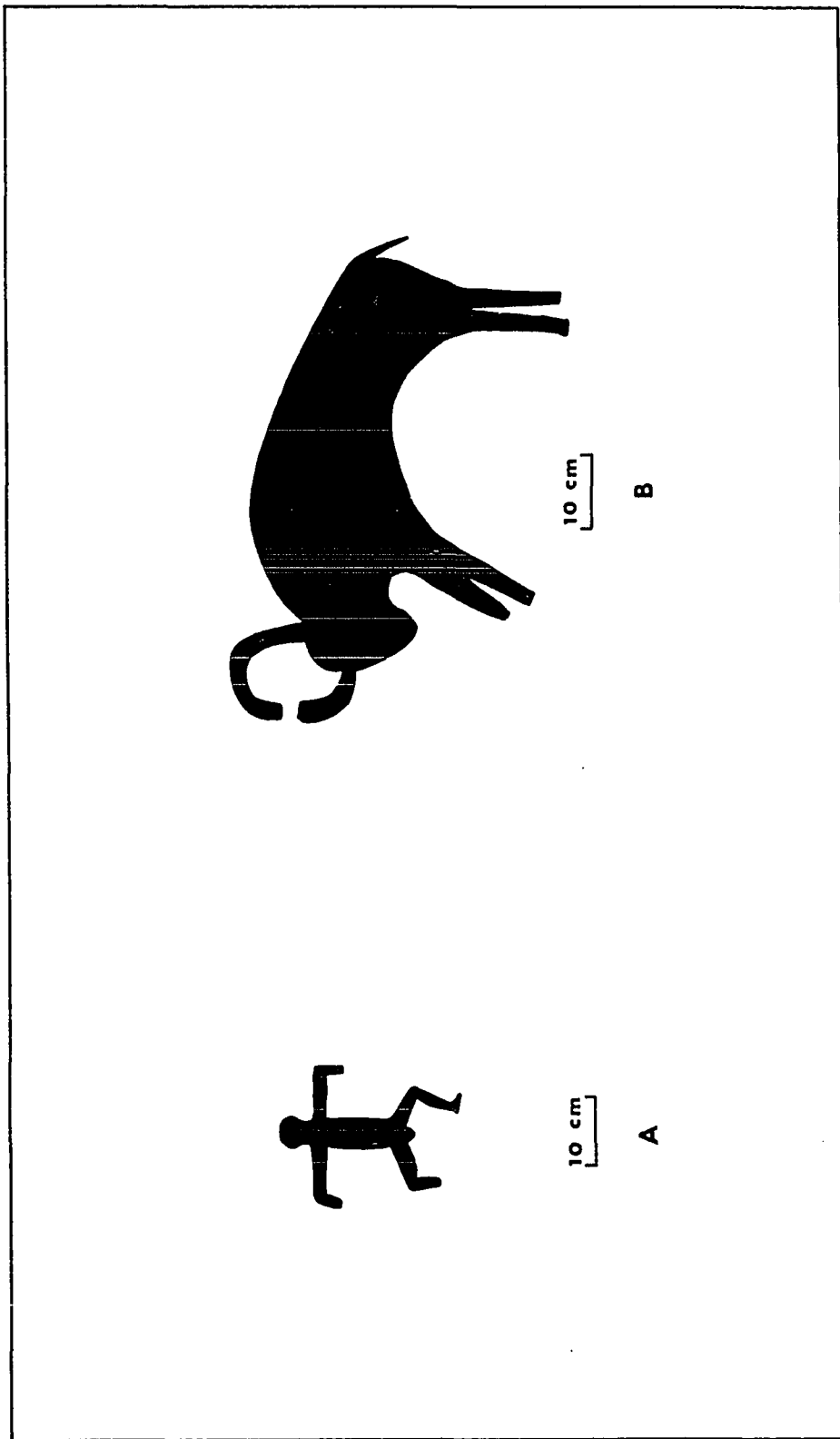
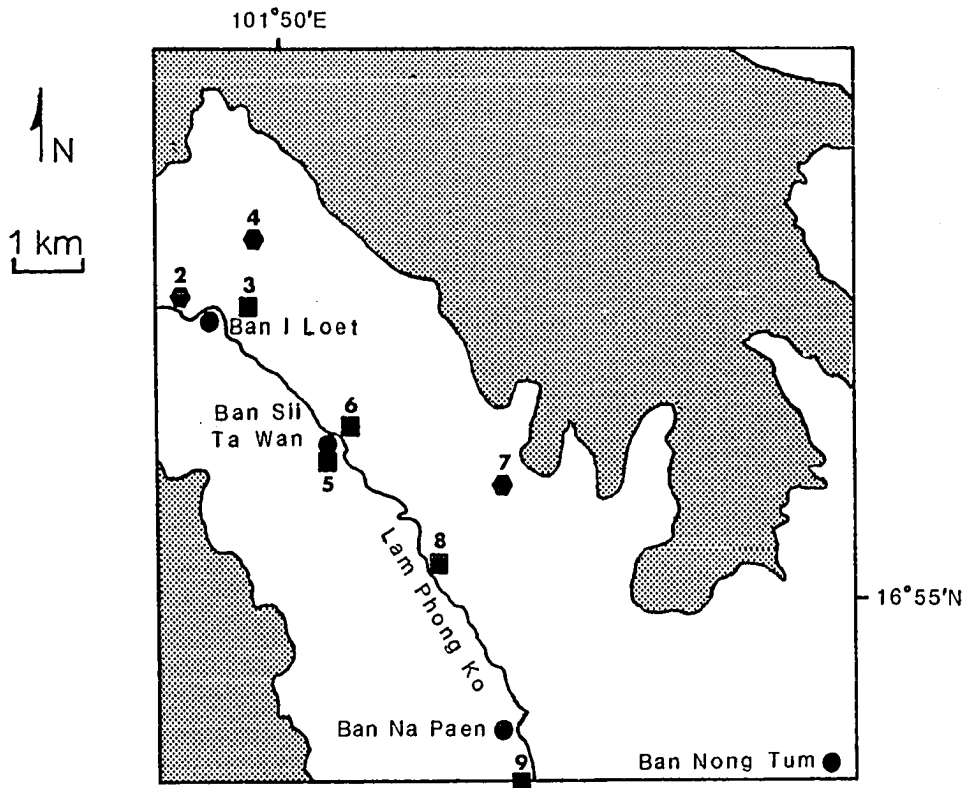


Figure 3-8. Sketches of rock paintings at Tham Kway Daeng.



- Sandstone highland:Phu Kradung Formation
- Lowland:Phu Kradung Formation
- Perennial Stream
- Village surveyed
- Other survey center
- Village not surveyed
- Open site
- Cave/Rockshelter site
- Other site

All sites prefixed with 17.09

Sources: Haworth et al. (1966:Plate 2)
 Javanaphet (1969)
 Soil Survey Division (1975)
 Field Observations

Figure 3-9. Square 3417 topography/geology and survey.

surrounding highlands so that this square can be considered to be exceptionally well covered.

The square comprises a river valley between sandstone mountains (Figure 3-9). The northeastern highland area is lower, with hills up to 764 m. In the southwest is the slope (up to a maximum of 800 m in the square) of Phu Kradung which reaches a maximum elevation of over 1200 m. The valley is relatively level near the river, and rolling with gradual increases in elevation on the mountain fringes. Valley elevations are generally between 240 and 300 m. The perennial stream, Lam Phong Ko, figures prominently in the square. Good rice soils are found in scattered patches in the valley (Figure A-5).

Eight sites were recorded in this square (Table 3-1; Figure 3-9). Two of these (17.09-2 and 17.09-4) are evidently the remains of jar burials: the former involving an earthenware vessel and the latter a stoneware vessel. Non Noy (17.09-7) is a small mound, about 8 m in diameter and 1 m high. Recent pottery was found eroding from one side. This site was said to be associated with evil spirits, but there was no clue as to its function.

The remaining five sites are a series of open sites located on terracelands along the Lam Phong Kho. Ban I Loet (17.09-3) occupies an area estimated to be 150 m in diameter on a high ridge. The Lam Phong Kho is about 500 m southwest across rice paddies from the site. Numerous prehistoric

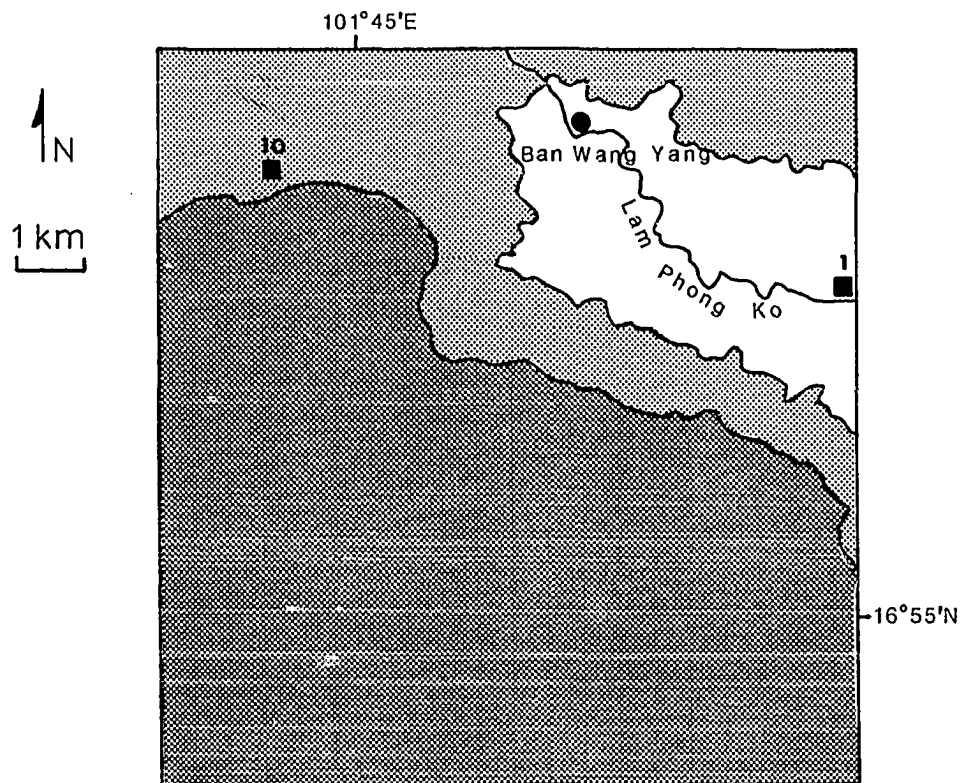
sherds were collected from the surface, along with a small groundstone adze/axe and two glass beads. A spindle whorl attributed to this site was given to the survey party by an informant. This site evidenced a dense cultural deposit of considerable potential depth. It was selected for excavation as described in Chapter 4. Ban Si Tha Wan 1 (17.09-5) is located in the village after which it was named. Its area is unknown since there is no visible mound and most artifacts observed were in the possession of villagers who did not remember their exact provenience. Prehistoric pottery and a groundstone adze/axe were shown to the survey party and described as having been found during construction activities in the village. Pottery similar to that in possession of the villagers was found by the survey party in an area of tree clearing near the center of the village. The villagers also had some iron slag which was said to have come from the river bank nearby, but none was observed when the informant showed the location to the survey party. Ban Si Tha Wan 2 (17.09-6) is located directly across the river from the site in the village (17.09-5). Some prehistoric sherds were found in one area of erosion. Informants indicated that similar pottery had been found in the vicinity when they dug down about half a meter. There was no visible mound and the site area was not defined. Non Thon (17.09-8) occupies a mound about 100 m in diameter and rising about 3 m above surrounding paddies and dry crop land. A few







prehistoric sherds were found over the surface of the mound. In a dam construction area on the northwest side of the site the deposit was observed to be at least 1 m deep and numerous prehistoric sherds were recovered. Informants said that many stone axes had been found during construction of the dam, but they had none to show the survey party. Na Phi Thon (17.09-9) was estimated to be at least 110 x 140 m. Prehistoric sherds were found in several locations on the site. A small piece of corroded bronze was also found. A groundstone adze/axe and a bronze axe in the possession of an informant were described as having been found on the site. A historic irrigation ditch was present on the site. An old wat was said to have been south of the site, but the informant could not relocate the boundary stones which he reportedly had seen while clearing land.

Square 3517

This is the westernmost of the three squares investigated in Row 17 (see Figure 3-1). This square (Figure 3-10) is believed to be well-covered in spite of the fact that there was only one village (Ban Wang Yang). Villagers here appeared to be on intimate terms with the surrounding territory and provided many leads in this vicinity.

This square is dominated by the sandstone mountains which comprise a large percentage of the area (Figure 3-10). The south half of the square is dominated by Phu Kradung,



-  Sandstone highland:Phu Kradung Formation
-  Sandstone highland:Phu Phan/Phra Wihan Formation
-  Lowland:Phu Kradung Formation
-  Perennial Stream
-  Village surveyed
-  Open site

All sites prefixed with 17.09

Sources: Haworth et al. (1966:Plate 2)
 Javanaphet (1969)
 Soil Survey Division (1975)
 Field Observations

Figure 3-10. Square 3517 topography/geology and survey.

which rises steeply to a plateau over 1200 m in elevation. The Phu Phan and Phra Wihan Formation is found above approximately 500 m elevation on Phu Kradung (LaMoreaux et al. 1959:Figure 5) and is sketched accordingly in Figure 3-10. The base of Phu Kradung and the lower ridges along the northern border of the square are of Phu Kradung Formation sandstones. The headwaters of the Lam Phong Ko are in this area which includes the head of the valley which figured prominently in the previous square (3417). No soils well suited for wet rice are mapped (Figure A-6), although a small amount of wet rice is presently grown in the area.

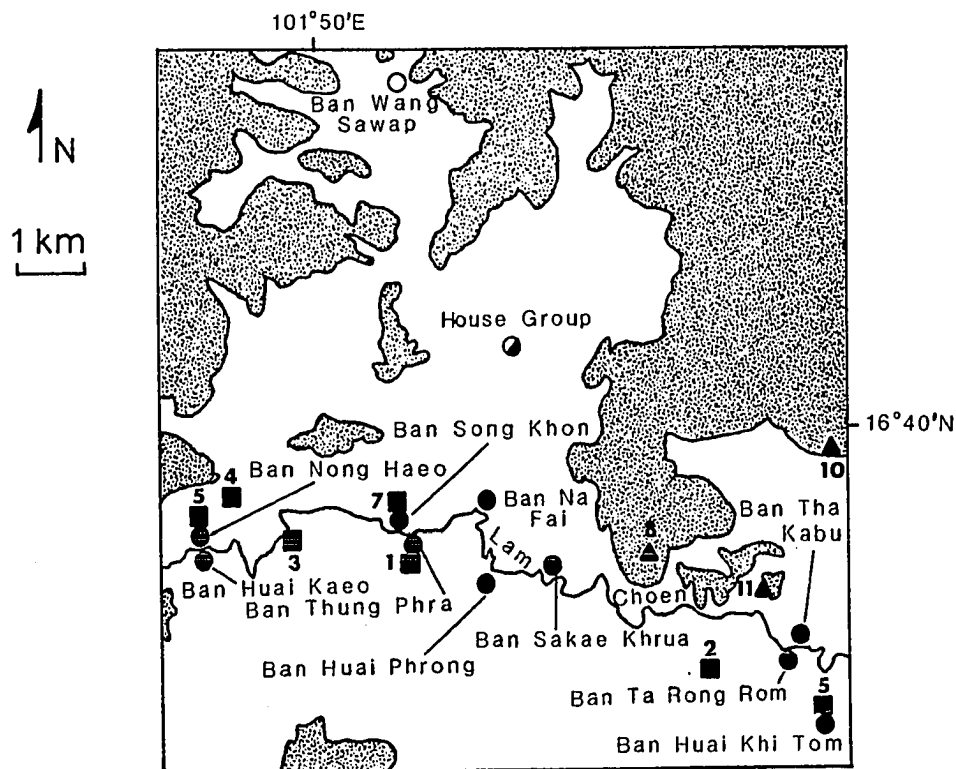
Two sites were recorded in this square (Table 3-1; Figure 3-10). Ray Saw (17.09-1) is a small open site of about 30 x 50 m on a low mound (1-2 m high) near the Lam Phong Ko. Prehistoric pottery was found, mostly in an area where part of the site had been dug away for road fill. Ray Sida (17.09-10) is an open site. It was all in very tall, dense brush: virtually no surface collection was possible and site area could not be determined. Stoneware was found in and near a small "cathole" excavation which indicated a deposit about 20 cm deep. The survey party also searched an area where the landowner said he had found a groundstone adze/axe and discovered one earthenware sherd.









Square 3420

This square is the eastern of two squares investigated in Row 20 (see Figure 3-1). The portion of this square north of the Lam Choen (Figure 3-11) is in Amphoe Chum Phai, Changwat Khon Kaen (22.01), and the portion south of the river is in Amphoe Khon San, Changwat Chaiyaphum (31.01). Survey in this square focused on the settlements along the river. The village in the north of the square was under guerrilla control and could not be surveyed. The survey party was able to make contacts in an outlying house group near the middle of the square, which did provide some additional coverage away from the river.

This square (Figure 3-11) comprises the relatively broad valley of the Lam Choen as it emerges from the mountains, and rolling plains studded with karst formations. Geologically, the area is primarily Ratburi Formation. Soils well and moderately well suited for paddy land are frequent and fairly extensive along both sides of the river (Figure A-7).

Ten sites were recorded in this square (Table 3-1; Figure 3-11). Three sites were in caves or rockshelters in the limestone outcrops in the southeast quarter of the square. Tham Nong Kha (22.01-8) is located in an interior sink in the karst formation. The sheltered area is about 35 x 38 m. The deposit was shallow and rocky. Prehistoric sherds, bone, and snail shells were recovered from the



-  Limestone outcrops:Ratburi Formation
-  Lowland:Ratburi Formation
-  Perennial Stream
-  Village surveyed
-  Other survey center
-  Village not surveyed
-  Open site
-  Cave/rockshelter site

Sites north of the Lam Choen are prefixed with 22.01 and sites south of the Lam Choen are prefixed with 31.01

Sources: Haworth.et al. (1966:Plate 2)
 Javanaphet (1969)
 Soil Survey Division (1973a,1973b)
 Field Observations

Figure 3-11. Square 3420 topography/geology and survey.

surface. Tham Phra of Ban Takabu (22.01-10) was recorded as two chambers. The lower chamber was 6 x 10 m. Evidence indicated that about a meter of deposit was removed for construction of a shrine. A few cordmarked sherds were recovered from outside the cave where the excavated earth was dumped. The upper chamber was much larger, but the floor was mostly rock. Bamboo debris, charcoal, stoneware sherds and earthenware sherds were found scattered on the surface. Tham Mup (22.01-11) had a sheltered area of 24 x 17 m. The site is now occupied by a shrine which has virtually destroyed any prehistoric deposit. Apparently reliable informants described finding a stone adze/axe, bones and pottery. The deposit was dug out to a depth of about 1.5 m, which was not to the bottom. Artifacts found on the surface apparently related to recent occupation of the site by a monk.

The remaining seven sites are a series of open sites all located near the river. Non Taw Lek (22.01-4) is located in the vicinity of a small satellite village which was named Ban Taw Lek ("Iron Furnace Village") because slag, along with other material, was found in digging up to 1 m deep for house construction. Informants described the site as a low mound and said that sherds had been visible over an area of 10 rai (an area about 130 x 130 m). The dense vegetation obscured surface artifacts and even the reported presence of a low mound. Prehistoric sherds were recovered

from the recent cut of a logging road on the west side of the site. Ban Nong Heo (22.01-5) is within the village. Recent earthenware sherds were recovered from two locations about 50 m apart and were said to have been found in another location in the village. Three burned clay features were also observed. One was sectioned and proved to be similar to ovens dug into the ground by current residents. The site of Ban Song Khon (22.01-7) is in the eastern part of the village. Earthenware, stoneware, and procelain sherds were recovered from the surface. A lens of shells was observed in the side of a roadcut and a burned clay feature similar to those on 22.01-5 was observed on the surface. Wat Phosi (31.01-1) is in the village of Ban Tung Phra. Prehistoric sherds were found in the wat and in a road cut just to the north. The site, thus, covers a minimum area of 50 m diameter, but the total size is unknown. Informants described finding bones in the wat area. A white bead of unidentified material was also found. Nong Ta Wang (31.01-2) rises about 1 m above paddies on the south and west, but the land continues to rise to a low ridge on the east and north. Earthenware sherds, some of which were identified as recent, were found at two locations on the site and along the edges of the paddies. The site is at least 50 x 70 m, but the total size is unknown. Ban Noy (31.01-3) is located in a small outlying cluster of houses. Landowners there described finding slag over an area of

about 30 x 60 m while digging gardens. No artifacts were found on the surface, but one landowner produced some slag and two sherds from a small hole he dug in front of his house. The deposit appeared to be only about 11 cm deep there. The site of Ban Huai Khi Tom (31.01-5) is, according to observations and informants, about the same size as the present village (ca. 120 x 300 m). The depth of the deposit was observed to be 1.6 m in a well in the southwest part of the village. Prehistoric sherds were observed in the well and collected from paddy dikes along the west side of the site.

Square 3520

This square is the western of the two square investigated at this latitude (see Figure 3-1). In this square (Figure 3-12), as in Square 3420, the Lam Choen is the border between Amphoe Chum Phae, Changwat Khon Kaen (22.01) and Amphoe Khon San, Changwat Chaiyaphum (31.01). About the northwestern third of the square (see Figure A-8) is in Amphoe Lom Kao, Changwat Petchabun (16.01).

The square (Figure 3-12) comprises the upper reaches of the Lam Choen valley amid relatively low mountainous terrain (maximum elevation 753 m). The mass of the mountains are sandstone representing the Phu Kradung Formation. Limestones of the Ratburi Formation are present in the southeast corner of the square. The Lam Choen is perennial, and flows clear

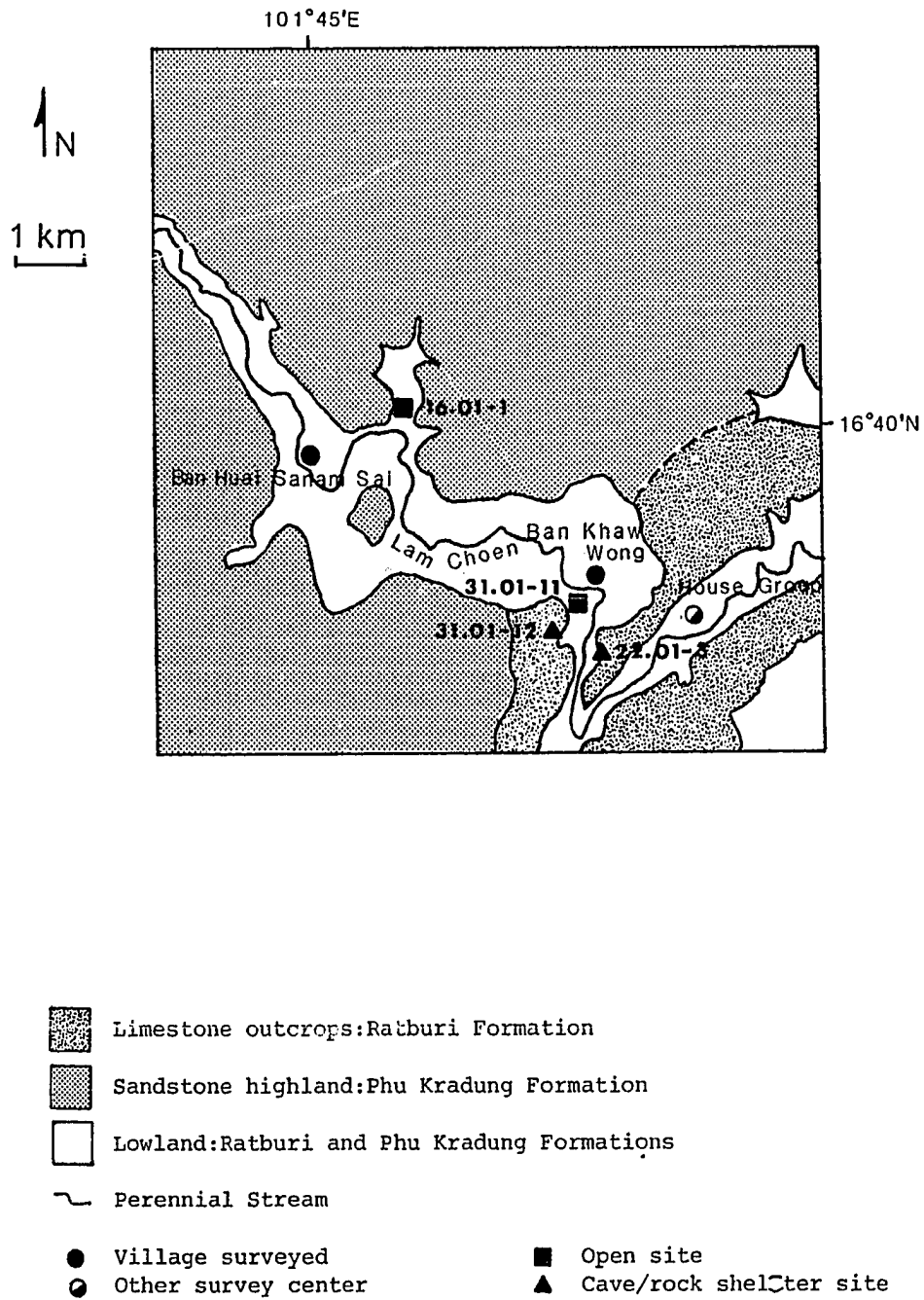


Figure 3-12. Square 3520 topography/geology and survey.

and cool in contrast to lowland streams in this part of the world. No soils well suited for paddy land were mapped in this square (Figure A-8) and no wet rice agriculture was observed by the surveyors.

Four sites were recorded in this square (Table 3-1; Figure 3-12). Two were rockshelters in the limestone formations in the southeastern quarter of the square. Tham Tewada (22.01-3) is a long, shallow shelter of about 10 x 50 m. Prehistoric sherds were found in two discrete areas of shallow deposit. The site was occupied by a monk and recent debris was also scattered. Tham Lay (31.01-12) is a single chamber about 6 x 6 m. Prehistoric sherds were recovered from the surface and from a hole about 30 cm deep dug by the landowner near the back of the shelter. Recent debris was also present as the result of occupation by a monk for a short time.

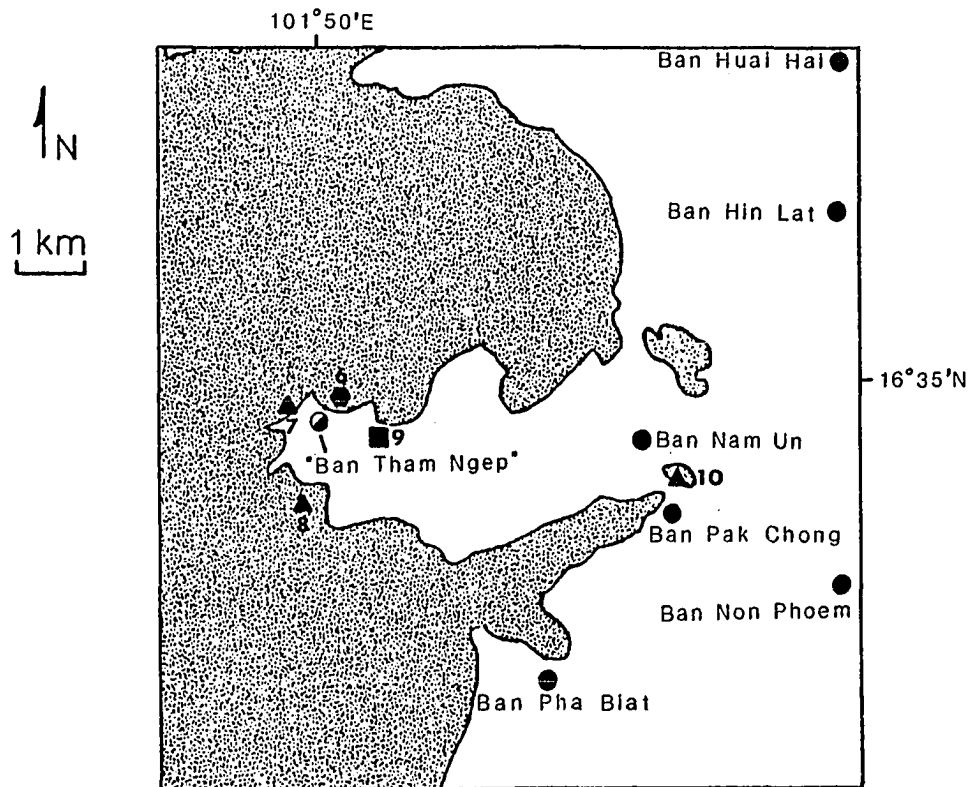
The other two sites are open sites along the Lam Choen and a tributary (Huai Fai Mai). Non Khaw Wong (31.01-11) is located on a terrace bordered on the east by an old channel of the Lam Choen. The area of the site is not known since all the recovered prehistoric sherds were found in eroded areas along the eastern terrace slope. Also recorded were two groundstone adze/axes and an iron axe attributed to the site. The deposit here was thought to be of considerable depth and density. The site was selected for excavation as described in Chapter 4. Huai Fai Mai (16.01-1) is on a








terrace along the stream. Prehistoric sherds were found around the landowners house and in the terrace bank nearby. Dense brush prevented determination of site size. The landowner also described finding several objects shaped like spindle whorls, and a groundstone adze/axe while digging in nearby fields. Another informant showed the survey party three groundstone adze/axes which he attributed to the site.

Square 3421

This was a single square investigated in Row 21 (see Figure 3-1). It is in Amphoe Khon San, Changwat Chaiyaphum (31.01). All the villages and one outlying house cluster ("Ban Tham Ngep") were covered in survey of this square (Figure 3-13). The villagers demonstrated an intimate knowledge of the surrounding uplands as well.

This square (Figure 3-13) encompasses a massive limestone formation, a valley, and adjacent lowland plains. The plains and valley lie at elevations of 240-300 m. The limestone hills rise abruptly to over 600 m and attain a maximum elevation of 1061 m. The topography of these karst formations is extremely rugged, with the elevations of internal sinks almost as low again as the exterior plains. Clearly these limestone hills are part of the Ratburi Formation. There are no major perennial streams in this square, but apparently several of the minor streams flow year round fed by springs in the karst formation. Soils suitable for paddy



- | | | | |
|---|-------------------------------------|---|-----------------------|
|  | Limestone outcrop:Ratburi Formation |  | Open site |
|  | Lowland:Ratburi Formation |  | Cave/rockshelter site |
|  | Village surveyed |  | Other site |
|  | Other survey center | | |

All sites prefixed with 31.01

Sources: Haworth et al. (1966:Plate 2)

Javanaphet (1969)

Soil Survey Division (1973b)

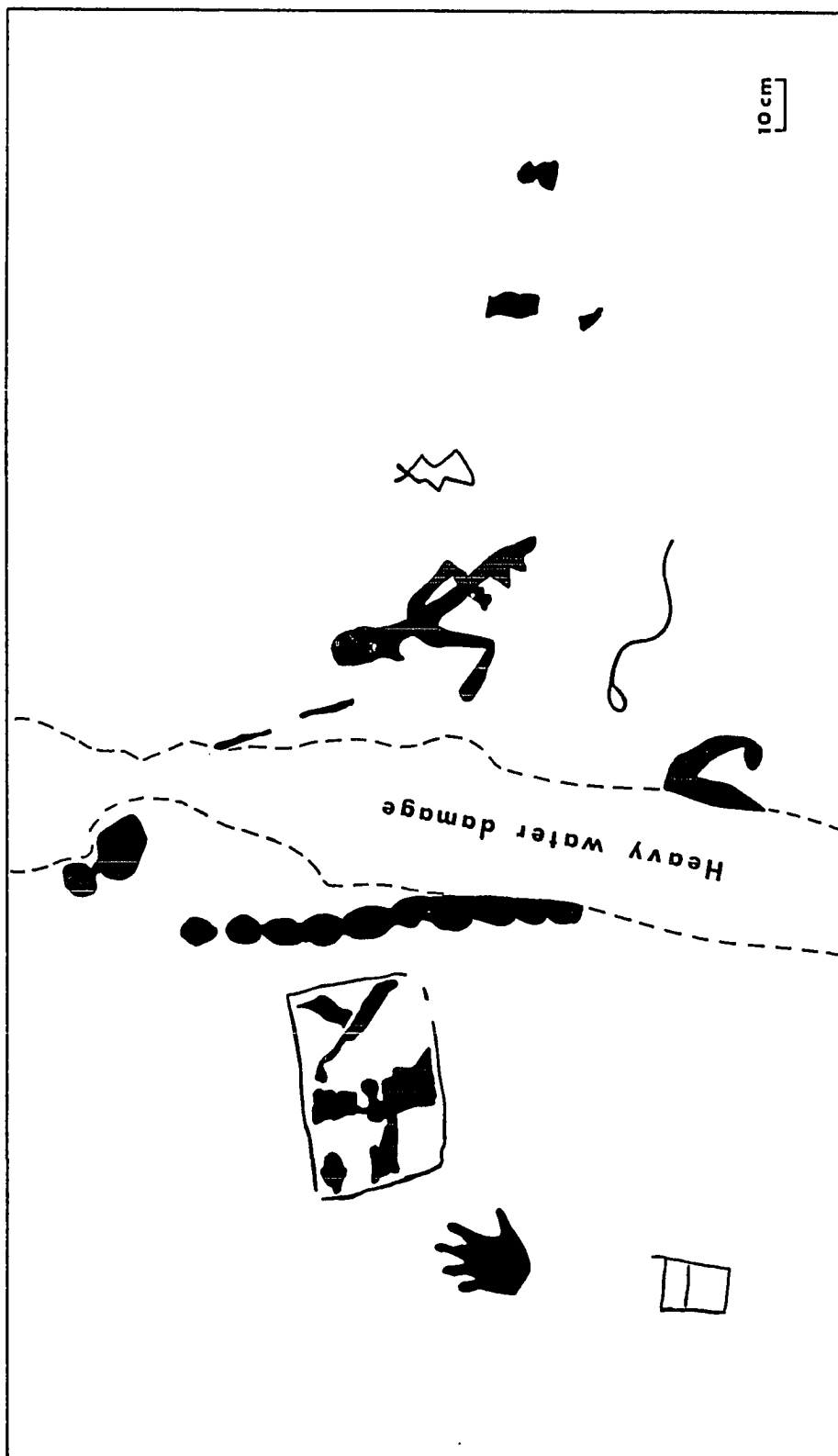
Field Observations

Figure 3-13. Square 3421 topography/geology and survey.

rice are fairly extensive in the southeastern corner of the square (Figure A-9). However, wet rice production in this area is extensive because the present villagers have constructed irrigation systems to channel water flowing from the surrounding hills.

Five sites were recorded in this square (Table 3-1; Figure 3-13). One, Ray Phun (31.01-9), was an open site without a visible mound. Prehistoric sherds were found on the surface of a cleared field and in a bordering ditch, but total site size is unknown. A spindle whorl fragment and a groundstone fragment were also found in the field. The landowner said he had found a skeleton with an iron spear next to the arm.

The other four sites are in rockshelters in the limestone outcrops. Tham Rup (31.01-6) is a small rockshelter of about 1.5 x 6 m. A series of paintings in red pigment were found on the northwest wall (Figure 3-14). Two handprints in red pigment were present on the southeast wall. No artifacts were found. Tham Ngam Mong Kham (31.01-7) was a large rockshelter, but was mostly filled with large blocks of limestone. A soil deposit about 9 x 30 m was present but bore little trace of occupation. One probable prehistoric sherd was found. Human bone was found in an area of pit disturbance, but lacking directly associated material, could be of any age. Tham Mup (31.01-8) has a sheltered area of about 7 x 10 m, with two areas of soil deposit. Prehistoric



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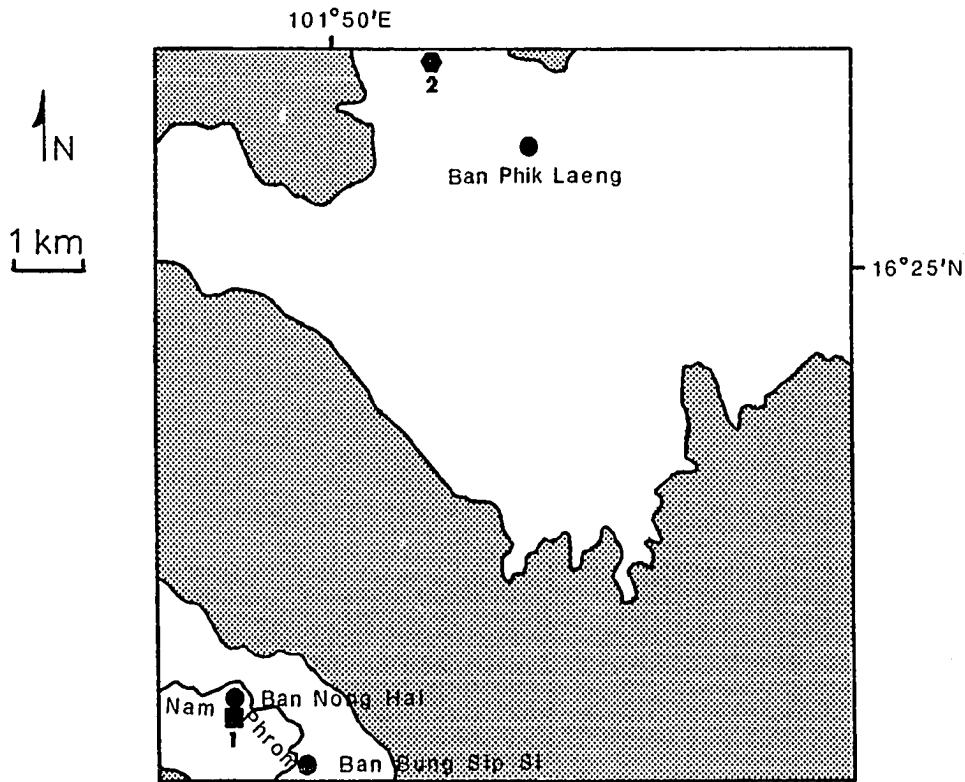
Figure 3-14. Sketch of rock paintings at Tham Rup.







and recent earthenware sherds, and stoneware, were recovered from the surface. A probe in one of the soil deposits reached 60 cm without striking rock. A series of ash and charcoal lenses were observed and a few earthenware sherds were recovered. Tham Phra of Ban Nam Un (31.01-10) is in a rockshelter about 11 x 12 m in area. The shelter is occupied by a wat. Some earthenware and stoneware were found on the surface around the wat building.

Squares 3423 and 3523

These two squares in Row 23 are at the southernmost extent of the survey (see Figure 3-1). They are discussed together since no sites were found in Square 3523. These squares are in Amphoe Kaset Sombun, Changwat Chaiyaphum, (31.03). All the villages in these squares were covered (Figures 3-15 and 3-16). The villagers did not exhibit a great deal of knowledge of the remoter highland areas.

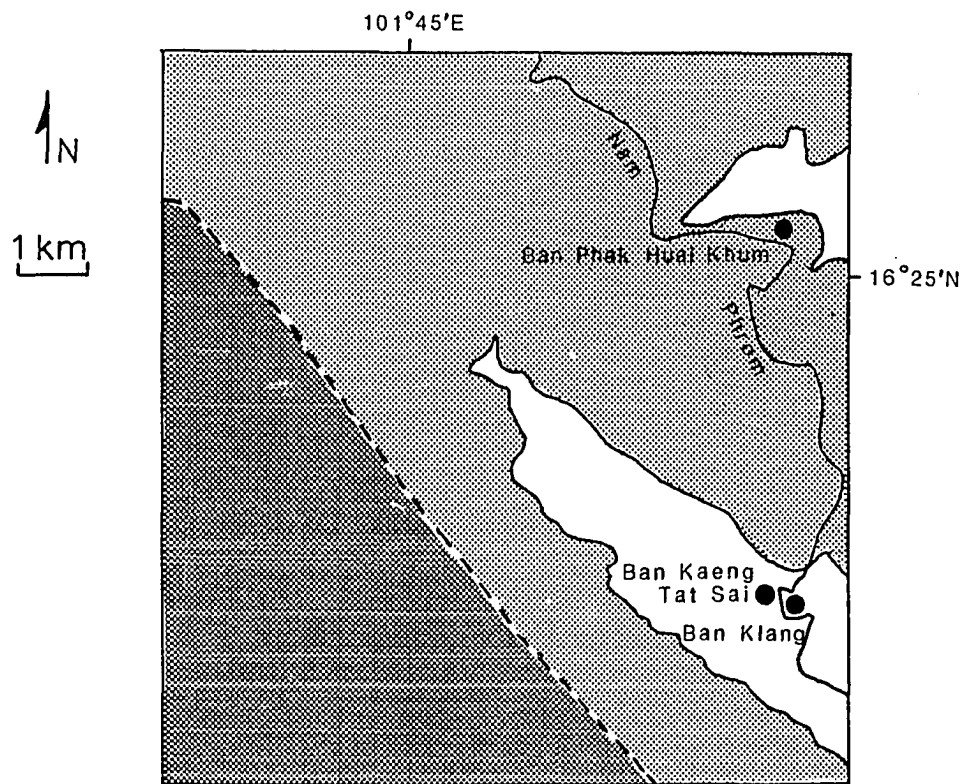
These squares (Figures 3-15 and 3-16) comprise the mountain slopes of Phu Khieo, and adjacent valleys and ridges. Geologically, most of the area is Phu Kradung Formation. The upper elevations of Phu Khieo are Phu Phan/Phra Wihan Formation. The precise elevations of these formations are not known to me and they are only tentatively sketched in Figure 3-16. The Nam Phrom is the principle perennial stream. It is a clear cool mountain stream in








-  Sandstone highland:Phu Kradung Formation
-  Lowland:Phu Kradung Formation
-  Perennial Stream
-  Village surveyed
-  Open site
-  Other site

Sources: Haworth et al. (1966:Plate 2)
 Javanaphet (1969)
 Soil Survey Division (1973b)
 Field Observations

Figure 3-15. Square 3423 topography/geology and survey.



-  Sandstone highland:Phu Kradung Formation
-  Sandstone highland:Phu Phan/Phra Wihan Formation
-  Lowland:Phu Kradung Formation
-  Perennial Stream
-  Village surveyed

Sources: Haworth et al. (1966:Plate 2)
 Javanaphet (1969)
 Soil Survey Division (1973b)
 Field Observations

Figure 3-16. Square 3523 topography/geology and survey.

this area. The valley at the foot of Phu Khieo contains good paddy rice soil (Figures A-10 and A-11).

Two sites were recorded in Square 3423 (Table 3-1; Figure 3-15). Ban Nong Hai (31.03-1) occupies a low mound about the same size as the present village (ca. 280 x 240 m). The survey party collected prehistoric sherds and a fragment of a groundstone adze/axe from one location on the northwest side of the site. Sherds were also given to the survey party by villagers who had found them in various parts of the village. Ray Kham (31.03-2) is apparently the remains of an iron-smelting furnace. A burned clay feature, slag, possible tuyere fragments, and a brick fragment were found in an area less than 5 m in diameter.

CHAPTER FOUR

EXCAVATION

Introduction

Following completion of the survey work, three sites were selected for excavation. The survey described in the previous chapter had failed to yield any evidence of the hypothesized transitional sites (see Chapter 1), and these three sites were selected for quite different reasons than foreseen at the beginning of the project, as described below.

Excavation Methodology

The three sites were selected for excavation essentially based on their potential to develop a cultural sequence for the survey area. Development of a subregional cultural sequence was an important, although secondary, goal in the original survey plan (Chapter 1). However, the primary goal had been obviated by the results of the survey (Chapter 3). The three sites were selected, first, because they had evidence for potentially deep and rich deposits. Thus, they were judged to have potential for sequences of ceramics and other artifacts which would define a cultural sequence. The

sites were also selected so that one site each would be in the northern, central, and southern areas of the survey in order to provide some clues to geographical variation within the subregion. This meant, however, that only one of several high-potential sites in the central part of the survey area were selected.

The excavations were conceived as small, test pits which would provide initial data on the stratigraphy and artifactual contents of the sites and be of feasible size for a small-scale project. The pits were placed at a central location on the site in order to maximize the chances of striking deep deposits. The pits were 2 x 2 m in the first two excavations (Non Khaw Wong and Ban I Loet). At Ban Puan Phu, a 4 x 4 m pit was opened, in part because the excavators were not so optimistic about finding deep deposits at this site.

The two Americans were assisted by four Thais on each excavation, and all instructions and discussion were in the Thai language. The interrelationship between crew composition and the use of the Thai language presents an interesting progression. At the first excavation, Duangkheo was still with the project and acted as interpreter for setting up the work and giving instructions to the three local villagers hired as laborers. However, as the excavation progressed it became obvious that the Americans could handle directing the project themselves. This was both because of

their general improvement in fluency in Thai after over a year in the country, and because the specific and repetitive directions for excavating were an easier language problem than making political and social contacts. Consequently, Duangkheo left the project after the first excavation and returned home to take up his own work again. The Thai crew at the second excavation included Naay Aan, who had participated in the first excavation, and three villagers from Ban I Loet. Aan acted as "lead man" based on his previous experience. At this excavation, the Americans demonstrated techniques to the Thai crew and perfected Thai language instructions. The final excavation at Non Khaw Wong was a smooth-running operation. The Americans had acquired a high degree of fluency, at least with regard to excavation instructions, and Aan had become quite proficient in his role. The three local workmen were soon instructed in details of their jobs and the Americans could spend more time on supervisory and recording duties.

General excavation was accomplished by hand excavation of natural or arbitrary levels. Soil was removed by bucket and screened through 12 mm (ie. 1/2 inch) mesh wire screen. Where no natural stratigraphy was visible, excavation was in 10 cm arbitrary levels. This was, in fact, the most common excavation method since at all three sites soil strata were normally indistinct in profile and not visible at all when excavating down in a restricted area (this is probably

generally true for similar sites in the region). It proved convenient to excavate pit features as separate units within each arbitrary level, thus providing arbitrary level slices through the pits as well as the general deposit. Within the levels, the excavation strategy was normally to create and advance one or more 10 cm faces across the excavation to attempt to "trap" any stratigraphic feature which may be present in the level. Screening the clayey soil proved to be an arduous chore but the results were gratifying.

Although artifacts were undoubtedly abraded somewhat by pressing or beating to move the material through the screen, recovery was very close to 100% of artifacts larger than the mesh and the increased opportunity for observation greatly improved the chances of recovering small objects such as beads.

Each excavation was recorded in field notes. Photographs and drawings were generally made for each level, any interesting feature, and the profiles at the end of excavation. Artifacts were bagged in a provenience/lot system which continued the bag numbers from the survey. The artifacts were sorted and processed according to standard procedures described in Chapter 1.

Non Khaw Wong Excavation

Location and Description

Non Khaw Wong (31.01-11) is in Square 3520, approximately 200 m south across the Lam Choen from Ban Khaw Wong, Amphoe Chum Phae, Changwat Khon Kaen (see Figure 3-12). The Lam Choen is a changwat boundary and the site area is officially administered by Ban Huai Kaeo, Amphoe Khon San, Changwat Chaiyaphum, but that village is approximately 5 km from the site.

Survey (Appendix B) indicated a prehistoric site with a potentially deep deposit. A collection of plain and cord-marked pottery included 17 rim sherds which were nearly all plain-surfaced and sand-tempered. A small groundstone adze/axe and a socketed iron axe were also found. The latter is probably not prehistoric.

The site is called a non (mound) following the initial description of the site by villagers. However, investigation of the site area indicated that the site location is not a mound in the normal sense but is a river terrace formation. The low land between the river and the "mound" appears to be a series of abandoned river channels. The site setting is an upland valley (see Square 3520 in Chapter 3). No soils well suited for paddy rice are mapped in the square (see Figure A-8). The site area has been

traditionally used for dry crop farming on a seasonal basis by residents of rice-growing villages to the east.

Stratigraphy

A single 2 x 2 m pit was excavated in Non Khaw Wong. The total excavated depth was 175 cm. A great deal of this depth, however, was excavated to clear the bottom of the deep pit designated Feature 3. The general deposit was barely half this depth.

The site was basically excavated in a series of 10 cm arbitrary levels (Levels 1-17) since there was little soil stratigraphy visible in excavation, aside from the features described below.

Soil strata observed in the profiles on completion of the excavation comprise a series of essentially horizontal zones (Figure 4-1):

Stratum 1. A dark reddish brown (5YR 3/3) friable sandy loam. This stratum averages 10 cm in depth. Soil in this stratum was loose and churned by animal and root disturbances. It contained virtually no artifacts but did contain recent snail shells and seeds.

Stratum 2. This stratum is essentially the same color as Stratum 1, but is denser and less disturbed. This approximately 20-cm stratum contained few items of modern debris and only a few prehistoric artifacts.

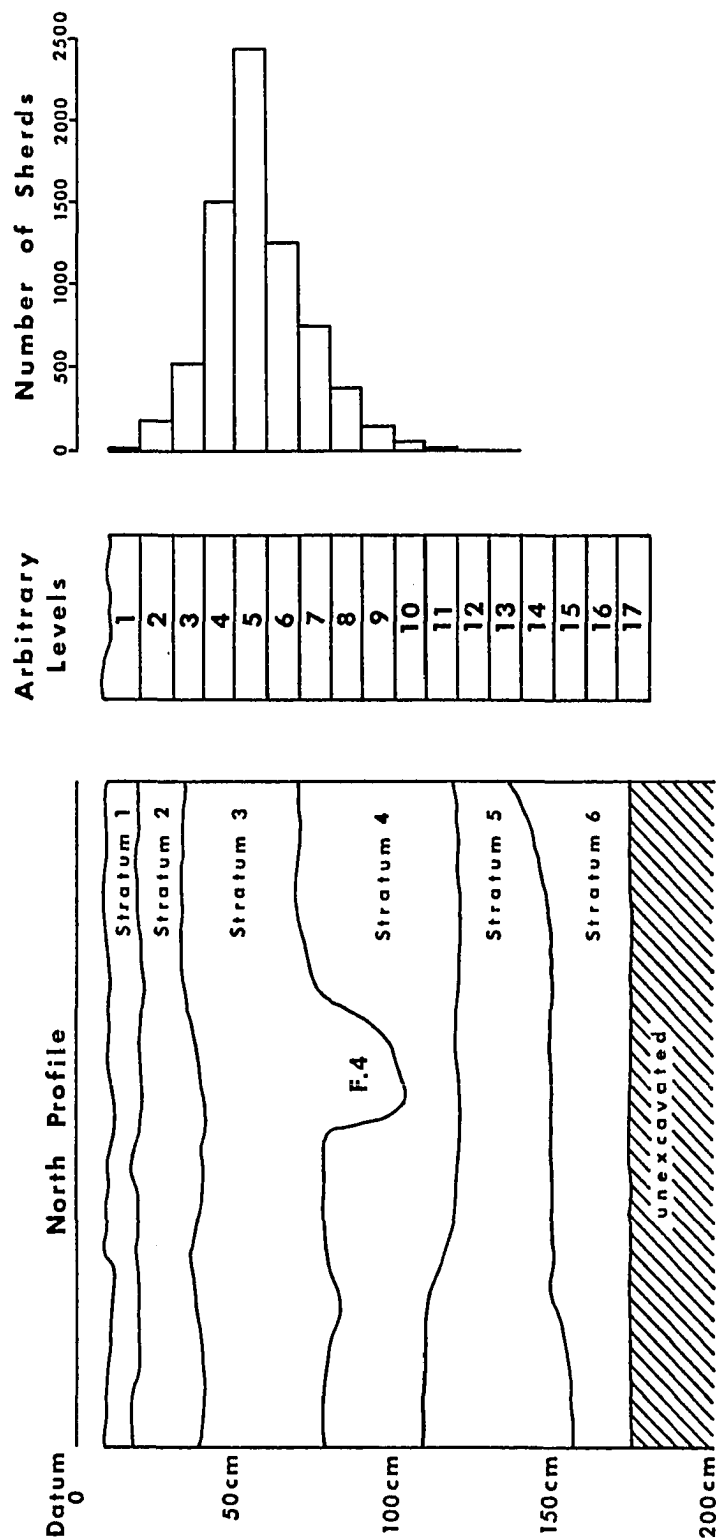


Figure 4-1. Non Khaw Wong stratigraphy.

Stratum 3. An approximately 40 cm stratum of dark brown (7.5YR 3/2) dense loam. The upper and lower boundaries of this stratum exhibit a gradual shift in color and texture which made this zone impossible to excavate as a bounded stratigraphic level. This stratum contained many artifacts.

Stratum 4. This 30-50 cm zone exhibits a transition in both color and texture between Stratum 3 and the subsoil. The transition is gradual through the zone.

Stratum 5. A dark reddish brown (5YR 3/3) heavy clay subsoil. This stratum had essentially no artifacts and few visible soil disturbances.

Stratum 6. An essentially arbitrary line separates a lower subsoil stratum in which brown soft laterite nodules are frequent. The softness of the laterite indicates a stable soil profile (Dudal and Moorman 1966:27).

Figure 4-1 illustrates the relationships between soil strata, arbitrary excavation levels, and numbers of sherds per level. With these correlations, the archaeological stratigraphy can be described as follows. Strata 1 and 2 are post-occupation. The archaeological deposit is closely correlated with Stratum 3 and does not appear to have any internal stratigraphic breaks. The maximum sherd densities are in Stratum 3 levels, intermediate densities are in levels at the top and bottom margins of the stratum, and densities in the remaining levels are low enough to be

accounted for by disturbances. The sherd density and other artifacts indicate that the deposit is probably the result of occupation. Stratum 4 is probably the result of now-invisible disturbances from the occupation levels. Strata 5 and 6 are subsoils archaeologically as well as in the soil profile.

Ten features, of widely varying value, were recognized in the course of the excavation.

Feature 1. A pottery, stone and bone concentration in the southeast corner of Levels 4 and 5. A large chunk of slag and a piece of iron were associated with the feature. There was no visible soil stratigraphy.

Feature 2. A sherd and bone concentration in Level 6. There was no visible soil stratigraphy.

Feature 3. A large and deep pit first recognized as an artifact concentration while excavating Level 7. A small soil pattern was seen at the surface of Level 8. But in excavating Level 8, the feature proved to be larger and to incorporate the adjacent Feature 5. The feature was defined in its final form at the surface of Level 9. The maximum diameter at the surface of Level 9 was 110 cm. The deepest point of the feature was 173 cm below datum. In addition to numerous artifacts, this feature included scattered human bone. No internal stratigraphy was detected and no trace of an in situ burial was found. It is thus difficult to hypothesize the function of the feature. It may have been a

burial disturbed by a large pit, or the human bone could have been deposited in the pit through some other means. The pottery and small finds from the feature (below) suggest the former.

Feature 4. This feature was defined as an oval soil pattern, with numerous sherds, at the surface of Level 8. However, in excavating Levels 8 and 9 the feature proved to be very irregular in shape and is probably a root or burrow disturbance. Neither this feature nor the pottery from it will be considered further.

Feature 5. Defined as a soil pattern at the surface of Level 8. This feature was found to be part of Feature 3 and all "Feature 5" material will be considered with Feature 3.

Feature 6. A small basin-shaped feature defined as a soil pattern at the surface of Level 9. It contained a few sherds and a bit of burned clay. The function is problematic; it could be the bottom of a feature which originated higher in the deposit.

Feature 7. Defined as a small circular soil pattern at the surface of Level 9. This feature went straight down for approximately 20 cm, but then branched out and is probably a disturbance. This feature was under Feature 4 and may be part of the same disturbance. This feature will not be considered further.

Feature 8. A small, roughly circular soil pattern defined at the surface of Level 10. This feature contained

quite a few sherds but proved to be a disturbance and will not be considered further.

Feature 9. A small conical feature defined at the surface of Level 11. This appears to be a good stratigraphic feature and it is unlikely to have been missed higher up in the deposit. It could be evidence for early occupation of the site but only contained two body sherds.

Feature 10. A small basin-shaped feature defined at the surface of Level 12. Like Feature 9, this appears to be a good stratigraphic feature but contains only nine body sherds and some bits of bone and burned clay.

Artifacts

More than 11,00 sherds were collected during the excavation. The numbers of sherds per excavation level were shown in Figure 4-1 and were discussed above in terms of site stratigraphy. Rim sherds (n=523) and decorated body sherds (n=52) were coded in laboratory analysis. No base sherds were identified. Four ceramic vessels were wholly or partially reconstructed from sherds excavated in Feature 3. Details of the ceramics are presented in Chapter 5.

A variety of other artifacts were found throughout the excavation (Table 4-1). The artifact distribution generally corresponds to the density of the deposit (see Figure 4-1). The skew in bronze and iron distribution initially led to speculation that the site would be the earliest of the three

Table 4-1. Small finds, slag, and burned clay from Non Khaw Wong excavation.

	Clay Balls n	Spindle Whorls n	Crucible Frgs. n	Bronze Detritus n	Bronze Artifacts n	Iron Detritus n	Iron Artifacts n	Clay/Glass Slag n	Stone Beads n	Stone Bead n	Slag g	Burned [*] Clay g
Level 1												
Level 2											1	50
Level 3			1			1						30
Level 4	5		2	1								210
Level 5	4	1	2		1	1	2	1			11	280
Level 6	4		8	2	1				2	1	1	240
Level 7	3		5	3	3				3			100
Level 8			2	1					1			60
Level 9				1								50
Level 10	1			1								20
Feature 1						1					1295	
Feature 3	3			3	4	1			29			580
Feature 2				1								30
Feature 4	1											60
Feature 5	1								1			50

*Minor amounts of burned clay from Features 7 and 10 are not listed here

excavated sites, with the lowest levels being pre-iron. But this is not confirmed by the carbon-14 dates (below). It is likely that the excavated area was used for bronze working early in the site's occupation. This interpretation is supported by the distribution of crucible fragments. The bronze artifacts and beads from Feature 3, along with the reconstructed ceramics, were probably associated with a burial disturbed by that feature. The slag indicates that iron smelting took place nearby but not in the excavated area.

Dating

Three carbon-14 dates were analysed for the Non Khaw Wong site. These dates were processed by the radiocarbon laboratories at the University of Pennsylvania and have been recently published (Hurst and Lawn 1984). The radiocarbon age is calculated using the 5568 half life. The University of Pennsylvania CRD one-sigma correction is based on published methods (Klein et al. 1982) but uses an unpublished table with one-sigma confidence ranges (Klein n.d.). The original corrected dates, which were reported to me by letter on 20 August 1981, are also presented here since those corrections were the basis of initial interpretations of the dates (Penny 1982). The original corrections were based on the tables published by Ralph et al. (1973). These

notes also apply to the dates reported below for Ban I Loet and Ban Puan Phu.

1. Feature 3, Level 14, northeast half. Radiocarbon age 1980 ± 180 years; 30 B.C. (P2943). Original corrected date; A.D. 20. CRD one-sigma corrected date; 195 B.C. - A.D. 230.

2. Level 7. Radiocarbon age 2210 ± 190 years; 260 B.C. (P2944). Original corrected date; 400 B.C. CRD one-sigma corrected date; 435-5 B.C.

3. Level 7. Radiocarbon age 2070 ± 170 years; 120 B.C. (P2945). Original corrected date; 130 B.C. CRD one-sigma corrected date; 395 B.C. - A.D. 65.

The arbitrary excavation Level 7 is at the bottom margin of the archaeological deposit. The two dates from this level overlap (one-sigma correction) 395-5 B.C. and this may be taken as a reliable date range for the level. Feature 3 was not detected until Level 7, but the date for this feature clearly suggests that it originates higher in the deposit and possibly close to the final occupation of the site. Painted lids, virtually identical to the painted lid from this feature (see Chapter 5), are found at Don Klang in levels dating to A.D. 0-500 (William Schauffler personal communication 1979).

Ban I Loet Excavation

Location and Description

Ban I Loet (17.09-03) is located in Square 3417, approximately 300 m east across the Lam Phong Ko from Ban I Loet, Amphoe Phu Kradung, Changwat Loei (see Figure 3-9).

The site setting is the river valley north of Phu Kradung (see square 3417 in Chapter 3). On the south and west, the site rises approximately 5 m above the surrounding land which is partly in rice paddies. On the north, the site is bounded by the steep bank of the Huai Dua. Eastward, no distinct site boundary was found but there is no evidence of the site in the bank of the Huai Dua where it passes east of the site. At the time of excavation, the site was partly cultivated for dry crops and partly under forest.

Survey (see Appendix B) indicated a prehistoric site with a rich and potentially deep deposit. Seventeen rim sherds were collected; they were predominantly smooth-surfaced and sand-tempered. Five decorated sherds were also collected; two were cordmarked with incised design, one was plain with incised design, one was cordmarked with a smooth-ed band, and one had a series of impressions. A small groundstone adze/axe and two small dark blue translucent glass beads were also found. A spindle whorl attributed to this site was given to the survey team in nearby Ban Si Ta Wan.

Stratigraphy

A single 2 x 2 m pit was excavated in Ban I Loet. The site was excavated in arbitrary levels (Levels 1-11) to a depth of 130 cm below datum.

Soil strata observed on completion of the excavation were (Figure 4-2):

Stratum 1. An approximately 20 cm stratum of very loose dark reddish brown (5YR 2.5/2) loam. This zone contained large quantities of, often large, charcoal pieces as well as fragments of burned clay. The soil was disturbed by root and animal disturbances and contained very few artifacts. The character of this zone is interpreted as the result of slash and burn agriculture.

Stratum 2. An approximately 50 cm stratum of dark reddish brown (5YR 3/2) clay loam. This stratum contained many artifacts. Some termite nests were found in this zone but it was generally much less disturbed than Stratum 1.

Stratum 3. The soil in this zone exhibits a gradual transition to the denser and clayier subsoil. This stratum is approximately 20 cm thick except where it penetrates down into the subsoil. Artifacts decline in number while laterite nodules increase.

Stratum 4. A dark reddish brown (5YR 4/3) dense clay subsoil with dark brown (7.5YR 5/8 - 3/4) hard laterite nodules very frequent. There are very few artifacts. Lower in the zone, the soil becomes mixed with a heavy pink clay.

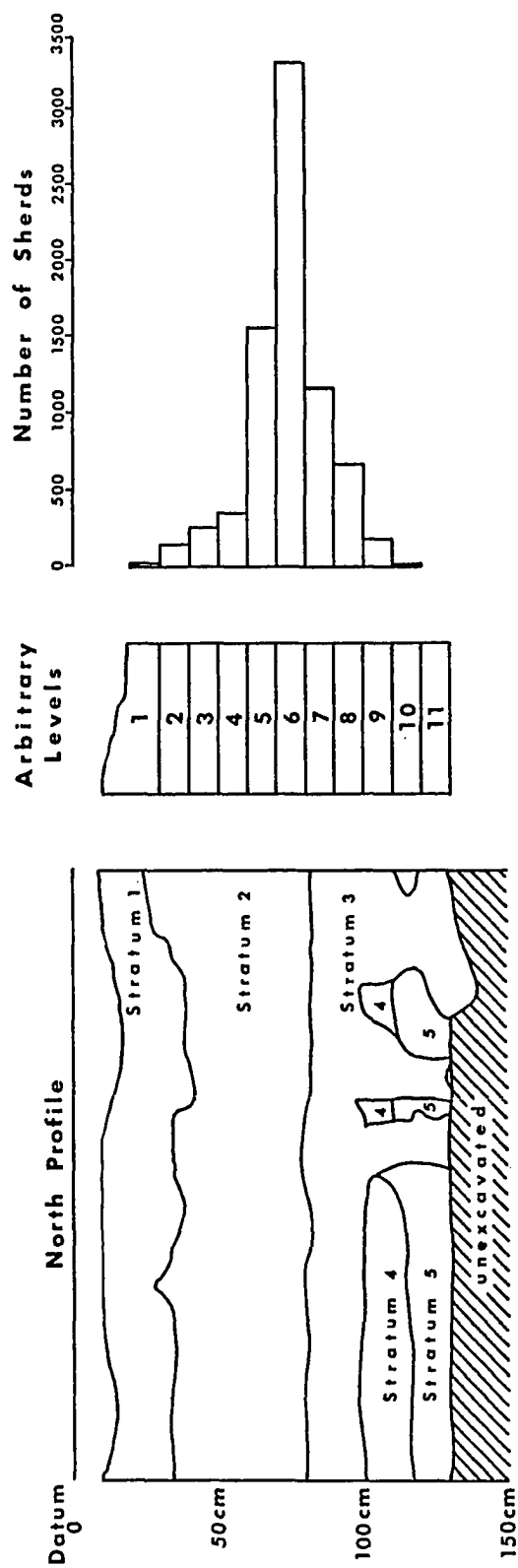


Figure 4-2. Ban I Loet stratigraphy.

Stratum 5. In this subsoil zone the pink (5YR 7/4) clay is dominant. There are fewer laterite nodules and essentially no artifacts.

Figure 4-2 shows the relationship between the soil strata, excavation levels and sherd densities. On the basis of these correlations, the archaeological stratigraphy can be interpreted as follows. Soil Stratum 1 and the upper part of Stratum 2 (approximately Levels 2-4) were deposited after the occupation which concentrates in the lower part of Stratum 2 (approximately Levels 5-6). Stratum 3 is probably, in part, the result of accumulated disturbances from the occupation. However, the results of the investigation of Feature 2 (below) indicate that some of this strata may be accounted for by an earlier occupation of the site. Strata 4 and 5 are subsoils both archaeologically and in the soil profile. The hard laterite in Strata 4 is probably the result of lowering of the water table at some time in the site's history (Dudal and Moormann 1966:27). This would be consistent with an erosion cycle proposed on the basis of evidence from Feature 2.

Two features were defined in excavation:

Feature 1. This feature is a rather amorphous mass of burned clay found in Level 7. The feature itself yields no clue as to its function but clay/slag fragments are frequent in the site and concentrate in the same level as the feature (see Table 4-2). They suggest that the burned clay feature

may be the remains of a smelting furnace. Other burned clay fragments also concentrate in this level and they are also likely to be associated with the feature.

Feature 2. A pottery feature which included a very large pot and four smaller vessels (see Chapter 5). The soil stratigraphy indicated that the vessels were in the bottom of a pit excavated into the subsoil. The vessels in this feature appear to have been "sliced off." The large pot is represented by approximately one-third of the side lying in the feature. Sherds from this pot are very thick and it is very unlikely that they were missed in the reconstruction. This indicates that the upper portions of the feature were destroyed by some natural or human action, and therefore, that a stratigraphic break exists which was not visible in the soil. This stratigraphic break would have been in arbitrary Level 8 (Figure 4-2).

Reviewing the evidence from higher levels indicates that Feature 1 and the vessel BIL1 (see below) were probably related to an unseen soil surface above Feature 2. Conversely, some of the sherds from Levels 8 and 9 may be from an early occupation of the site.

Artifacts

More than 7800 sherds were collected from the Ban I Loet excavation. The numbers of sherds per excavation level were shown in Figure 4-2 and were discussed above in

relation to the site stratigraphy. Rim sherds (n=278) and decorated body sherds (n=45) were coded in laboratory analysis. No base sherds were identified. Six ceramic vessels were wholly or partially reconstructed from excavated sherds. One vessel (BIL1) was found in Levels 7 and 8, and the other five were from Feature 2. Details of the ceramics are presented in Chapter 5.

A variety of other artifacts were found (Table 4-2). The distribution in levels corresponds to the density of the deposit (see Figure 4-2), except for the clay balls which seem to be closely correlated with the earliest levels. Feature 2 is remarkable for the number of beads. This supports the idea that the large jar may have contained a burial, the bones having been destroyed while the feature was exposed at the eroded surface.

Dating

Two carbon-14 samples were analysed for the Ban I Loet site. These are:

1. Level 8. Radiocarbon age 2340 ± 230 years; 390 BC (P2940). Original corrected date; 440-460 BC. CRD one-sigma corrected date; 650-175 B.C.
2. Feature 2, Levels 10 and 11. Radiocarbon age 2460 ± 200 years; 510 BC (P2941). Original corrected date; 710-730 BC. CRD one-sigma corrected date; 815-390 B.C.

Table 4-2. Small finds, slag, and burned clay from Ban I Loet excavation.

	Clay Balls n	Spindle Whorls n	Crucible Frgs. n	Bronze Detritus n	Bronze Artifacts n	Iron Detritus n	Iron Artifacts n	Clay/ Slag n	Glass Beads n	Slag g	Burned Clay g
Level 1											490
Level 2								1			70
Level 3						1		1			40
Level 4				1							60
Level 5						1	2	3		*	80
Level 6	1		3			3	2	9	1	*	610
Level 7	1		1			1		10		*	1160
Level 8	2	1		2		4	1	7	4	*	570
Level 9	2							1			220
Level 10											
Level 11											
Feature 1											830
Feature 2	1		3			3	1	3	19	*	160

*Reported present; weight not available

The original corrected dates clearly supported the stratigraphic break in the deposit suggested by the pottery from Feature 2. The initial interpretation (Penny 1982) was that Feature 2 represents an early utilization of the site dating at least back to 710-730 B.C., and that above the stratigraphic break, another occupation sequence begins at approximately 440-460 BC. The CRD one-sigma corrected dates tend to deemphasize the difference in the dates, although they do not contradict the stratigraphic interpretation.

Ban Puan Phu Excavation

Location and Description

Ban Puan Phun (17.09-23) is in Square 3515, approximately 500 m north of Ban Puan Phu, Amphoe Phu Kradung, Changwat Loei (see Figure 3-5).

The site setting is a rich rice-growing area (see Square 3515 in Chapter 3). The site is surrounded on three sides by paddy fields. The land continues to rise gradually to the north and there is no defined site boundary on that side. However, there is no sign of the site in the wat to the north of the site. At the time of the excavation, the site was largely in brush with a few houses.

Survey (see Appendix B) indicated a rich but not very deep deposit. Forty-four rim sherds were collected from the surface. They were primarily smooth-surfaced and sand-

tempered. Nine decorated body sherds were also found; the designs included incised line, applique, impression, smooth band, and modeled line. Several other artifacts were also recovered including five clay pellets, three spindle whorls, three iron artifacts, two beads, and slag.

Stratigraphy

A single 4 x 4 m pit was excavated in Ban Puan Phu. The pit was excavated in a series of arbitrary levels (Levels 1-7), and soil strata, to the surface of a continuous hard laterite stratum between 70 and 90 cm below datum. A series of features were excavated in the laterite to a maximum depth of 138 cm below datum.

The soil strata observed in excavation and in the profiles on completion of the excavation are (Figure 4-3):

Stratum 1. This stratum is a dark reddish brown (5YR 2.5/2) clay loam which contains a great deal of charcoal. It averages barely 5 cm in depth. This zone is probably the result of clearing and burning the site area. This stratum was removed in the arbitrary Level 1.

Stratum 2. The soil is a dark reddish brown (5YR 2.5/2) clay loam. It is slightly redder than Stratum 1, but the same Munsell color chip is closest to both. This stratum is approximately 30 cm thick. There were numerous artifacts and much less charcoal. This stratum was excavated in arbitrary levels.

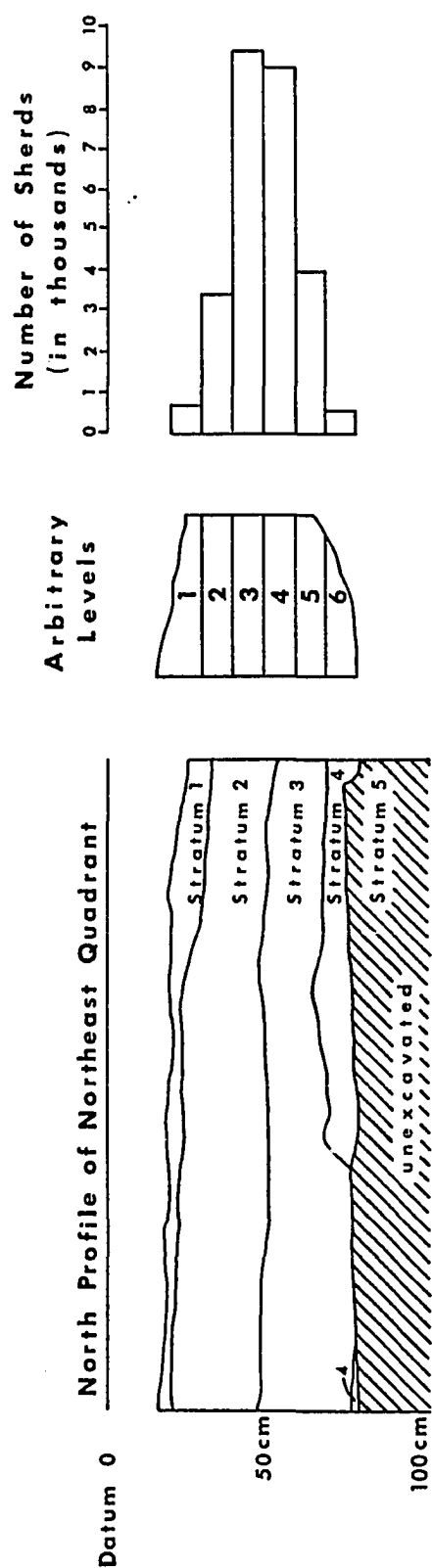


Figure 4-3. Ban Puan Phu stratigraphy.

Stratum 3. The soil is a dark reddish brown (5YR 3/2) sandy clay loam. This stratum is generally between 20 and 30 cm thick. There were numerous artifacts. The upper boundary of this stratum was recognized in the profile after excavation. The boundary is very faint and may be merely a difference in moisture content. This stratum was excavated in arbitrary levels down to its distinct lower boundary with Stratum 4 or Stratum 5.

Stratum 4. This stratum of mottled yellowish clay is irregular and discontinuous. The principle colors of the dense clay are yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6 - 5/8). There are also some dark brown (7.5YR 3/2) laterite-like spots. The maximum thickness of the level is approximately 25 cm and, where present, it averages approximately 10 cm. There were very few artifacts. This soil was excavated stratigraphically.

Stratum 5. This stratum consists of densely packed hard laterite nodules. This stratum is known to be at least 30 cm thick as the result of excavating Feature 15 to a depth of 138 cm below datum. This stratum is the bottom of the excavation.

Figure 4-3 shows the soil strata, excavation levels and sherd densities. With these correlations, the archaeological stratigraphy can be described as follows. Stratum 1 is a post-occupation deposit. Strata 2 and 3 are occupation deposits with a faint but possibly distinctive stratigraphic

break between them. Strata 4 and 5 are subsoils both archaeologically and in the soil profile. The hard laterite of Stratum 5 is probably the result of lowering of the water table (Dudal and Moormann 1966:27) at some time in the site's history. This would be consistent with an erosion cycle and may account for the possible stratigraphic break between Strata 2 and 3.

Nineteen features were recognized. Twelve other small features were recorded as post holes. Two burials were also excavated.

Burned clay features. A series of eight burned clay features were uncovered in the excavation. Feature 1 is the most complete. The shape is like an igloo; a dome with a tunnel entrance. The tunnel entrance is believed to provide access for air and fuel. The dome has an opening in the top on which, presumably, the object to be heated was placed. All, but one, of the other burned clay features are partly destroyed fragments of similar-shaped features. Feature 5 is a large, amorphous mass of burned clay which is probably the remains of one or more similar features. Feature 3 contained a large chunk of wood charcoal which was submitted for carbon-14 dating (see below). The fill of all the other burned clay features is very similar to the general deposit, indicating that the fuel remains, for some reason, were removed. There is no direct stratigraphic evidence to determine if these features were built on a ground surface

or dug into the ground. The former appears more likely since these features differ in two ways from modern examples of small cooking ovens dug into the ground which were observed by the survey party. First, the air intake of the modern subsurface ovens must angle up to the ground surface. This does not appear to be the case for these features. Second, the soil surrounding the subsurface ovens is mottled to various thicknesses as the result of the burning. The excavated features are composed of burned clay of uniform thickness and color. More specific functions of these features is not known. No slag was found in association with them, indeed it is relatively rare in the site. Bronze casting does not seem to be a possibility as there is no casting spillage and few crucible fragments in the site. Cooking is a possible function. These features could be involved in some stage of cloth manufacture which is important at the site judging from the number of spindle whorls recovered (see Table 4-4).

Feature 1. This feature is the most complete of the clay features, but is fragmented in situ. This feature stands 25 cm high (from 50 to 75 cm below datum). The air entrance faces east.

Feature 2. Extant portions of this feature were 27 cm high (50 to 77 cm below datum). The air entrance faces northeast. This feature had been cut away by Feature 12 and the extant portions were in good condition.

Feature 3. This feature was 22 cm high (53 to 75 cm below datum) but was surely higher originally. Most of the feature appeared to be present, but it was crushed inwards. The direction of the air entrance is indeterminant. A large chunk of charcoal was found in this feature and was submitted for carbon-14 dating.

Feature 4. This feature was adjacent to the south side of Feature 3. It was nearly complete in circumference but most of the top was missing. Extant portions were 18 cm high (54 to 72 cm below datum). The air entrance faces east.

Feature 5. This feature is an amorphous mass of burned clay fragments. It is probably the remains of one or more similar burned clay features. The clay fragments were between 60 and 80 cm below datum.

Feature 8. A largely destroyed burned clay feature along the north wall near Feature 1. The air entrance, virtually all that remains of the feature, appears to face east. The extant portion is a maximum of 23 cm high (60 to 83 cm below datum).

Feature 9. This feature is a small fragment of another clay feature cut away by Feature 12. The remains are 14 cm high (60 to 74 cm below datum). The direction of the air entrance is indeterminant.

Feature 11. This feature is a fragment of a burned clay feature which appears to have been cut away by an

unseen feature or disturbance. The extant portion is approximately 14 cm high (from 61 cm below datum into Level 7, exact bottom elevation not recorded). The direction of the air entrance is indeterminant.

Infant burials. Under Buddhist practice, infants are not cremated but buried. Other parts of the site are presently used for such burials according to informants. The burials found in the excavation are likely to be the result of such practices by the ancestors of the present villagers. Five excavation features are placed in this category. Feature 18 is an infant burial in an earthenware rice-steaming pot. Excavation of Feature 6 revealed a few tiny pieces of bone in association with the remains of a talcum powder can. Three other features similar in shape and fill are believed to also be infant burials although no remains were found.

Feature 6. A soft, dark gray (5YR 3/1) stratigraphic feature defined at the surface of Level 5. Bone preservation was poor and only a few fragments were recovered. Part of a corroded metal can with a plastic cap and filled with talcum powder was recovered. The feature, as excavated from the surface of Level 5, was a shallow basin with a maximum depth of 10.5 cm, but the feature surely originated from near the present surface.

Feature 7. An oval area of slightly darker and softer soil was recognized at the surface of Level 5. It was

originally dismissed as a disturbance because of lack of evidence for cultural origin and root mottling in the bottom. The feature number was assigned after the excavation of Feature 5 which is similar in size, shape (root activity notwithstanding), and fill. When the south profile was cleaned this feature could be seen originating at the top of Stratum 2, ie. near the modern surface. This feature is then believed to also be an infant burial with no grave goods and no recoverable bone.

Feature 17. The southeast corner of the pit cuts a portion of a feature with a very soft, virtually sterile fill. This feature was dismissed as a disturbance when excavated from the surface of Level 5, but was recognized as a coherent stratigraphic feature in the profiles. The feature originates near the modern surface and penetrates through the deposit to the laterite stratum. It is believed to be a recent infant burial similar to Features 6 and 7. Bone and grave goods, if present, were not found in the portion of the feature excavated.

Feature 18. A pot located in the west profile was removed as a feature on completion of excavation. No soil stratigraphy was seen. The pot is a ceramic rice-steaming pot and was believed by the workmen to be an infant burial. When the contents of the pot were examined, this proved to be the case. The pot itself is an unusual example of recent period archaeology. Bayard (1971b:65) found the absence of

this type of vessel to be a significant discontinuity between the villagers of Ban Nadi and the upper levels of excavations at Non Nok Tha. At the time of the excavation, a metal version of the same vessel had entirely replaced the ceramic version in this survey area.

Feature 19. Cleaning of the east profile revealed the outline of a feature sectioned by the pit but not recognized during excavation. The color and texture of this feature is very similar to the general deposit. The slightly darker feature can be seen to originate from near the present surface. The portion cut by the profile extends to 56 cm below datum. It is thought to also be an infant burial.

Stratigraphic features.

Feature 10. A stratigraphic feature of black soil with burned clay. The feature was an irregular, shallow basin located adjacent to the mouth of Feature 2. Maximum depth was approximately 9 cm. The soil is so dark that it is unlikely that the feature was missed higher in the deposit.

Feature 12. A stratigraphic pit feature defined at the surface of Level 6 in the area amid the burned clay Features 2, 5, and 9. The fill was black (5YR 2.5/1) and contained numerous artifacts. This feature was unlikely to have been missed in higher levels. At the surface of Level 7, the feature could clearly be seen outlined along the destroyed portion of the adjacent Features 2, 5 and 9. The pit was

therefore clearly excavated at a later date than those burned clay features.

Feature 13. A stratigraphic feature defined at the surface of Level 6. This feature contained sherds and other artifacts but is of dubious stratigraphic value. It was unclear in excavation and could not be seen in the profile where expected. It overlies Burial 1 and may be related to it. Unfortunately, this feature was exposed when the pit was flooded. This may have caused a false interpretation of the soils.

Feature 14. A shallow basin stratigraphic feature defined at the surface of Level 6. The maximum depth was 6 cm and few artifacts were found. The fill appeared to be softer and darker than the matrix soil, but it is a dubious feature for the same reasons as Feature 13.

Feature 15. A stratigraphic feature first recognized as a disturbance cutting the lower legs of Burial 1. This feature is approximately 40 cm in diameter and extends to a depth of 138 cm below datum. The sides are nearly vertical and the bottom is nearly flat. It appears to be a large post hole, such as for a large house support post. The excavated portion of the feature is in the mottled clay and laterite strata and is clearly defined. However, the level of origin of the feature was not stratigraphically detectable, except that it clearly postdates Burial 1. This

feature contained relatively little cultural material; a few sherds and some stone, bone, and burned clay.

Feature 16. A shallow basin shaped feature with dark fill adjacent to Feature 12 and under the area of Feature 5. This feature was approximately 32 cm in diameter and a maximum of 6 cm deep. It contained two sherds and little else.

Post holes. Twelve small features were recorded as post holes. They are shown on Figure 4-4, along with Feature 15 which appears to be a large house-post hole. These post holes do not form an obvious pattern but are additional evidence for occupation.

Burial 1. Burial 1 (Figure 4-5) extends from the west profile directly east into the southwest quadrant of the square. The primary burial is supine with the head to the west. Some other miscellaneous human bone in the same pit under the primary burial indicated a second disturbed burial in approximately the same location. Stratigraphic pursuit of the burial feature began in Level 6 when cleaning the pit after flooding revealed a zone of dark reddish brown soil extending across the southwest quadrant and into the southeast quadrant. This soil feature proved to overlies the burial except that it extended vaguely further east. The lower walls of the burial feature were clearly defined where they met the yellow clay stratum. The bottom of the burial feature was clearly defined in the hard laterite stratum

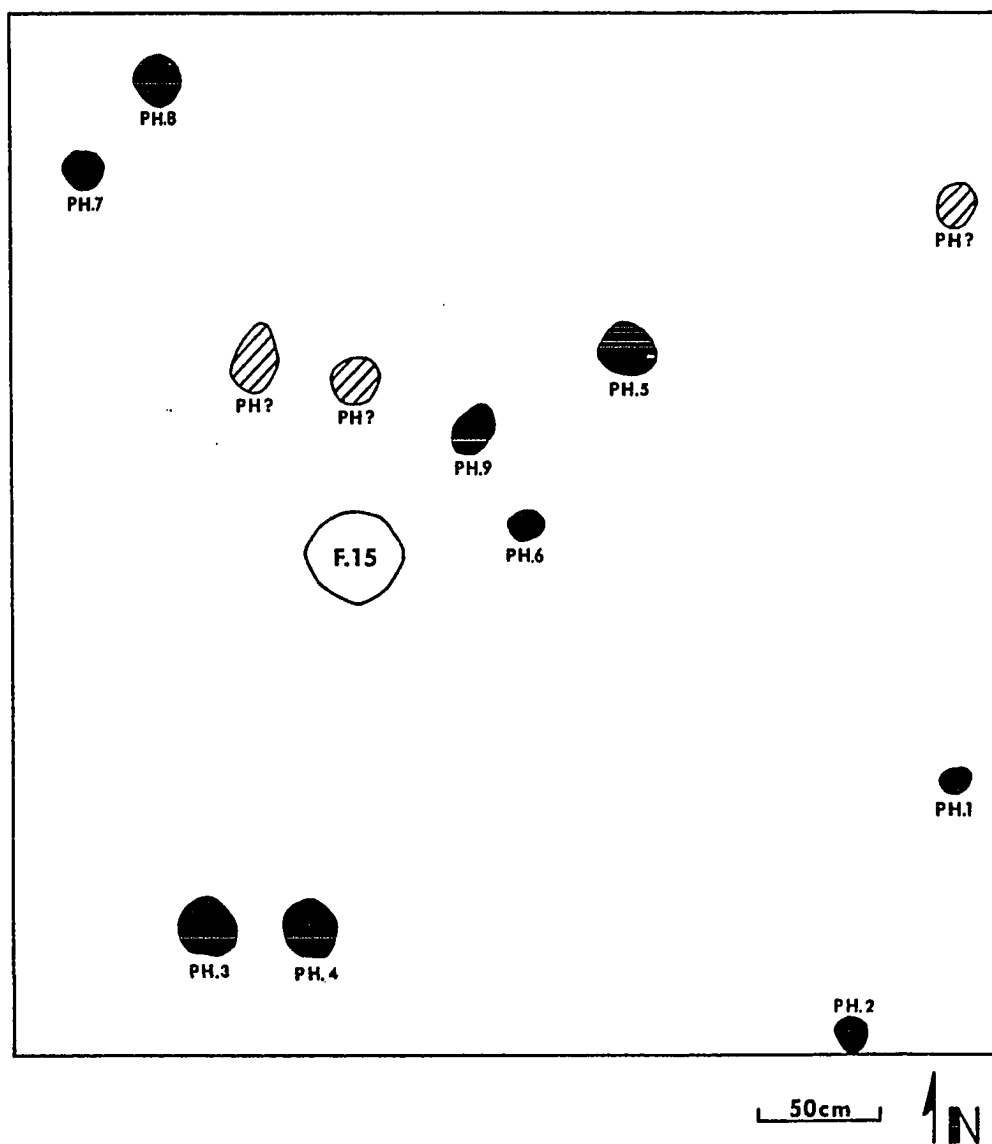


Figure 4-4. Ban Puan Phu post holes.

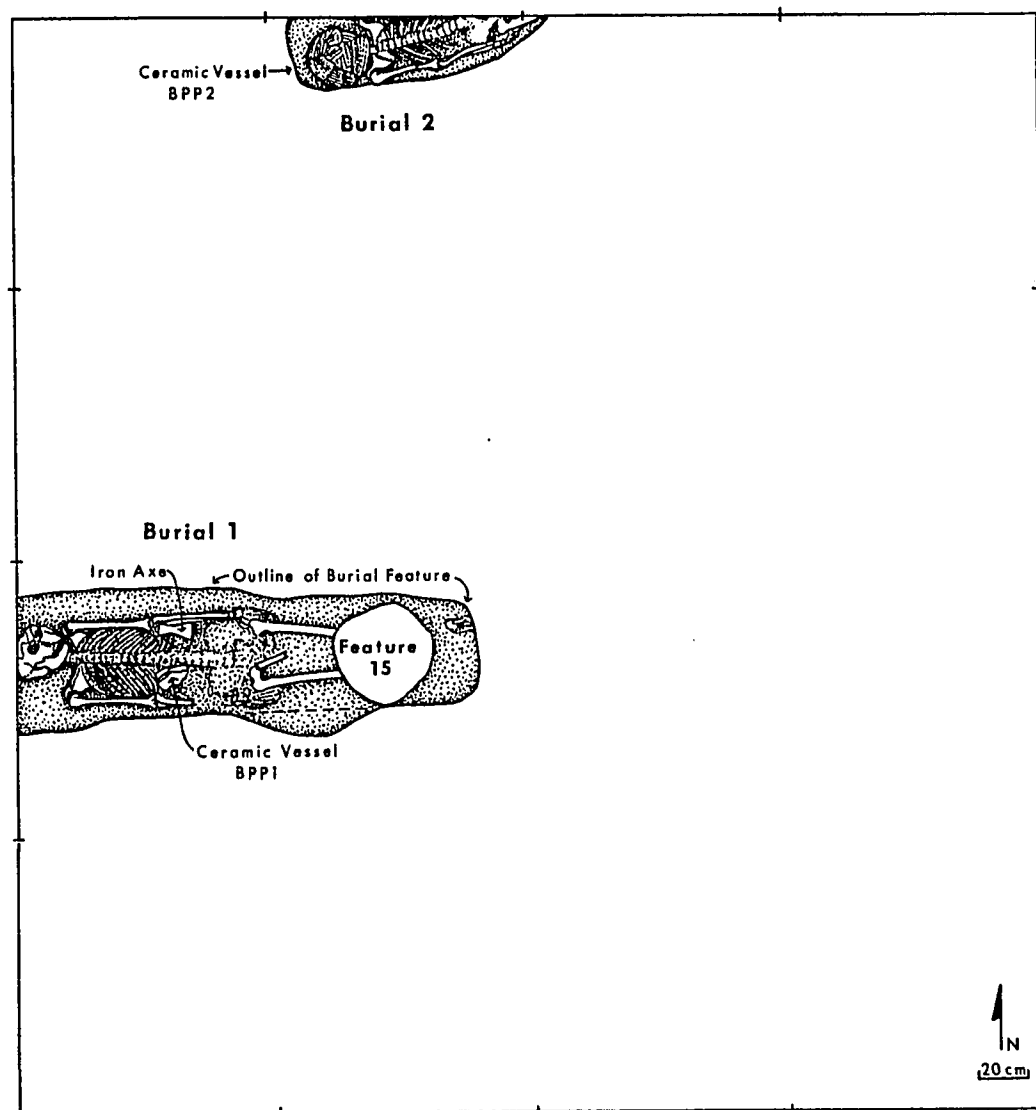


Figure 4-5. Ban Puan Phu burials.

where it forms a slight depression. The lower legs of the primary burial were cut by Feature 15. A socketed iron axe was found on the right side of the abdomen. A fragment of an earthenware lid (vessel BPP1) was found on the right side of the abdomen, but since it is fragmentary it may not have been buried with the primary burial. The same probably applies to the fragments of bronze bracelets found in the mouth and beside the left knee of the primary burial. A large number of glass beads were found in the burial excavation. They were scattered throughout the burial feature and none seemed to be in situ with the primary burial.

Burial 2. The head of Burial 2 (Figure 4-5) is in the northwest quadrant of the square and the burial extends northeastward into the balk. The burial is single and supine with the arms at the sides. The burial was not recognized stratigraphically until bone was struck. The bottom of the burial feature was clearly defined in the yellowish clay and laterite strata but no outline of the walls were detected. An earthenware bowl (vessel BPP2) covered the face of the burial. Several opaque glass beads were associated with the burial. Five were found apparently in situ by the right wrist, one was on the right scapula and possibly not in situ, and the remainder were recovered by fine-screening the burial fill.

Artifacts

More than 27,400 sherds were recovered from the Ban Puan Phu excavation. The numbers of sherds per excavation level were shown in Figure 4-3 and were discussed above in relation to the site stratigraphy. Earthenware sherds (n=849), decorated body sherds (n=211) and base sherds (n=6) were coded in laboratory analysis. Also analysed were 9 earthenware fragments which were recognized as detached appliques. Two earthenware vessels were partially reconstructed from excavated sherds: one from Burial 1 and one from Burial 2. Details of the vessels and analysed earthenware sherds are presented in Chapter 5.

Nineteen stoneware sherds were found in the excavation (Table 4-3). All, but one, were found in Level 3 or above (this includes the sherd from the profile). This distribution seems to correlate with the possible stratigraphic break between Strata 2 and 3 (above). If the correlation holds, the stratigraphic break would be highly significant archaeologically. In general, the stoneware is similar to types still in use in the area: gray stoneware with incised body decorations, and brown or olive glazed stoneware.

A variety of other artifacts was recovered in the excavations (Table 4-4). Slag and burned clay are also listed here. Generally, the small finds are distributed throughout the deposit (see Figure 4-3). There are internal differences in distribution which are interesting, but not

Table 4-3. Stoneware sherds from Ban Puan Phu. n=19









	<u>Provenience</u>	<u>Form</u>	<u>Surface</u>
<u>Rim</u>	Level 2		Smooth
	Level 2		Glazed
	Level 3		Glazed
	Level 3		Smooth
	Level 3		Smooth
<u>Base</u>	Level 1		Smooth
	Level 3		Glazed and Modeled Line
	Level 3		Smooth
<u>Body</u>	Level 2	-	Incised
	Level 2	-	Glazed
	Level 3	-	Incised
	Level 3	-	Zig-Zag Incised
	Level 3	-	Zig-Zag Incised
	Level 3	-	Zig-Zag Incised
	Level 3	-	Zig-Zag Incised
	Level 3	-	Incised
	Level 3	-	Glazed and Modeled Line
	Level 5	-	Incised
	Profile	-	Zig-Zag Incised

Table 4-4. Small finds, slag, and burned clay from Ban Puan Phu excavation.

	Clay ¹ Balls n	Spindle Whorls n	Crucible Frgs. n	Bronze Detritus n	Bronze Artifacts n	Iron Detritus n	Iron Artifacts n	Clay/ Slag n	Glass Beads n	Clay Bangle n	Pottery Disk n	Figurine n	Slag g	Burned ² Clay g
Level 1				1									13	530
Level 2	1	1					1						7	1480
Level 3	2	4			1	1	3	1	1				42	3510
Level 4	6	2	1			3		1	1		1		15	4160
Level 5		1	2			1		5					2	3610
Level 6 & 7	1	1				3							7	900
Feature 10	1		2					1					6	30
Feature 12	1	2								1		1	367	960
Burial 1					2		1		504					130
Burial 2									10					180

Notes: 1. 1 clay ball from Feature 7 not listed.

2. small amounts from Features 13, 14, 15, and 16 not listed

conclusive, with regard to a possible gap in the occupation between Strata 2 and 3 (approximated by Levels 1-3 versus Levels 4-7). One of the iron artifacts from Level 3 was recognized by the workmen as part of a plow harness. It is recent or historic. But iron, albeit small detritus, is found to the bottom of the site. The maximum weight of slag is in Level 3 but the maximum number of clay/slag fragments is in Level 5. The clay balls and spindle whorls seem to straddle Levels 3 and 4. The crucible fragments are all from Levels 4 and 5 but are too few to provide a strong argument. The small finds seem to indicate rather subtle shifts in site activities rather than a stratigraphic break as suggested by the stoneware.

The clay bangle, pottery disk, and figurine are unique for this survey. The pottery disk may be a game piece (see Bayard 1971b:64). The figurine fragment has been tentatively identified as a water buffalo. It is flat rather than three-dimensional and has several "stab" marks.

Dating

Two carbon-14 samples were analyzed for the Ban Puan Phu site:

1. Feature 3. Radiocarbon age 2440 ± 50 years; 490 BC (P2938). Original corrected date; 660-720 BC. CRD one-sigma corrected date; 640-415 B.C.

2. Burial 1. Radiocarbon age 2680 ± 210 years; 730 BC (P2939). Original corrected date; 900 BC. CRD one-sigma corrected date; 1105-745 B.C.

The site was initially interpreted as a homogenous deposit with some historic material present in upper levels. It was therefore expected to be transitional late prehistoric (or protohistoric) to historic, ie. as late as A.D. 1000. In particular, the date for Burial 1 was expected to demonstrate a late non-Buddhist (ie. noncremation) culture. On the contrary, the dates provide evidence for an early "iron age" culture. The charcoal from Burial 1 was composed of a number of small pieces from the burial feature, generally above the level of the burial. The bottom of the burial is in the hard laterite stratum so there was no possibility of obtaining a charcoal sample from under the burial. The date could apply to the burial or to the strata through which it was dug. The stratigraphy is complicated by an apparent earlier burial in the same feature. The date, therefore, cannot be precisely related to the site stratigraphy. However, it is important to point out that there is no possibility that the date pertains to an earlier pre-iron level since none exist at the site. The date from Feature 3 was obtained from a single large piece of charcoal from a secure stratigraphic context.

It is necessary, then, to provide an alternate explanation for the historic or recent material found in the

deposit. These later artifacts may be merely recent intrusions. This is the most reasonable solution given the recent infant burial features. An attempt was made (above) to argue for a stratigraphic gap in the occupation based on soil stratigraphy and the distribution of stoneware, earthenware bases, and a recognized historic iron artifact. Such a gap, however, would have to be on the order of a thousand years. None of the other artifacts indicate a radical break in the occupation. It is extremely unlikely that the site would have been reoccupied a thousand years later by people using very similar pottery. The apparent distribution may be merely an illusion (ie. the more recent objects are merely from undetected intrusions, as above). If the distribution is not an illusion, the upper levels of the deposit must be some kind of eroded and redeposited mix of historic and prehistoric deposits. This is a possible solution consistent with the shallowness of the burials and the hard laterite, but it seems a rather remote possibility.

Neither the stratigraphy nor the prehistoric ceramics (see Chapter 5) provide a method of relating the two dates. It must be assumed that the dates represent all, or part, of the temporal span of the occupation. The Burial 1 date is early for iron and it is unlikely that the site was occupied earlier than that date. On present evidence then, the prehistoric occupation of the site began ca. 900 B.C., and ended some time near or after ca. 500 B.C. The site has

been used historically for infant burials, and probably other activities, which have resulted in some recent intrusive material.

Summary

The three excavations revealed rather shallow deposits which were rich in sherds and a variety of other artifacts including clay balls, spindle whorls, crucible fragments, bronze artifacts and detritus, iron artifacts and detritus, slag and clay/slag fragments, and glass beads. The pottery appeared to be generally similar among the three sites, and the series of radiocarbon dates all range in the first millenium B.C. Details of the ceramics and cultural sequence are presented in the next chapter, before considering the implications of these results in the final chapter.

CHAPTER FIVE
CERAMIC ANALYSIS AND CULTURAL SEQUENCE

Introduction

Most of the laboratory analysis was conducted at The University Museum, University of Pennsylvania. The general procedures are described below. By far the most important result of the laboratory analysis is the ceramic data. The excavated ceramics provided a basis for describing the temporal affiliations of the other, unexcavated sites from the survey, and thus were key to development of a cultural sequence for the survey area. The ceramic analysis and cultural sequence form the main body of this chapter. Ceramics are also instrumental in describing geographic patterns in Chapter 6.

Laboratory Analysis

Laboratory analysis began in the field. All collected material was recorded in a provenience-lot type system of sequentially numbered bags. All appropriate material was washed and sorted into artifact classes. Nonartifactual stone was tabulated, weighed, and discarded. Reconstructable

ceramics, rim sherds, base sherds, decorated body sherds, a random sample of ordinary body sherds, other artifacts, and natural history specimens were shipped to The University Museum for further analysis under a loan agreement with the Thai Fine Arts Department and Ministry of Education.

At The University Museum, artifacts were analysed in accordance with the system developed by the Northeast Thailand Archaeological Project (Schauffler 1979; Hastings 1982; Applebaum 1982). This analysis is facilitated by the use of the computerized SELGEM data base management system, which allows the combined recording of metric and descriptive data. A detailed description of this analytical system should be part of the publication efforts of the project. Ceramic data is presented in the following section. Other artifacts which are tabulated in Appendix B and Chapter 4 are not discussed in further detail.

All analysed artifacts were labeled with the bag number (representing the provenience) and an individual artifact number within the provenience unit. After analysis, all materials were repacked for return shipment to Thailand.

Ceramic Analysis

General Temporal Analysis

The ceramics were identified at a general level by classification as recent, historic, and prehistoric. These

are the categories used in Chapter 3 to characterize sherds collected during the survey. This part of the lab analysis, thus, is a refinement of the field identification of ceramics. The principal objective of this classification was to separate recent and historic occupations from the prehistoric occupations which were the focus of this research.

Historic/Recent

Following Bayard (1980b:25), historic occupation is ca. A.D. 1000 to 1850-1900, and recent occupation is less than ca. 100 years old.

The presence of stoneware and/or porcelain was a major indication of historic or recent occupation for the piedmont survey. Bayard (1980b:70-78) provides useful detailed descriptions of stoneware, porcelain, and other historic artifacts found in another survey in Northeast Thailand.

In the field, recent sites were sometimes identified by informants, and in that case, they were not formally recorded as archaeological sites. Following lab analysis, it was possible to identify some recorded sites as recent based on ceramics. Bayard (1980b:63-65) describes two modern pottery types made in Loei Province north of this survey (see Figure 2-2). However, these types were not recognized in the piedmont survey material. Earthenware found in modern contexts in the piedmont survey appears to be characterized by prepared-clay-temper. Solheim (1964) describes modern

manufacture of prepared-clay-tempered pottery in an area ca. 60 km east from the piedmont area. Details of the distribution of these, and other recent ceramics, are not known.

Earthenware was also found in some non-recent, historic contexts. These sherds were generally tempered with sand or other minerals. However, they were too few and too non-descript to form useful analytical categories of historic period earthenware.

Essentially, then, the presence of prepared-clay-tempered sherds was taken as evidence of recent occupation. Historic occupation was defined by the presence of stoneware and/or porcelain combined with the absence of recent ceramics (or other evidence of recent occupation).

Prehistoric

Positive identification of prehistoric pottery was a problem during the survey. Prehistoric sherds found in the piedmont area were quite different from those in other areas which were familiar to the survey party either from personal experience or from the literature. Of course, an initial working knowledge of local ceramics was gathered from contextual observations during the survey. Details of prehistoric ceramics based on laboratory analysis are provided in the following section.

Excavated Prehistoric Ceramics

The excavations provided a large number of sherds from prehistoric contexts. Thus, laboratory analysis of these sherds provided an explicit definition of prehistoric ceramics for the survey area.

Vessels

Twelve ceramics were classed as reconstructed vessels and are described here (note that some are thought to have functioned as lids and are thus not actually vessels).

Non Khaw Wong.

Four reconstructed vessels are from Non Khaw Wong,
Feature 3:

NKW1. This shallow basin-shaped vessel (Figure 5-1B) is believed to be a lid. It was not found in association with a pot, but is similar in form to lids found in association with pots elsewhere (Schauffler 1976: Figures 3 and 4). This lid is completely reconstructed. The temper is fine sand. The height is 6.3 cm. The diameter at the lip of the rim is 23.8 cm and the maximum diameter is 27.0 cm. Wall thicknesses are; lip of rim .7 cm, rim 1.0 cm, and body .9 cm. The rim is smoothed and has three sets of black painted lines perpendicular to the rim. The body has smoothed-over cordmarking and a circular pattern of cord-wrapped paddle

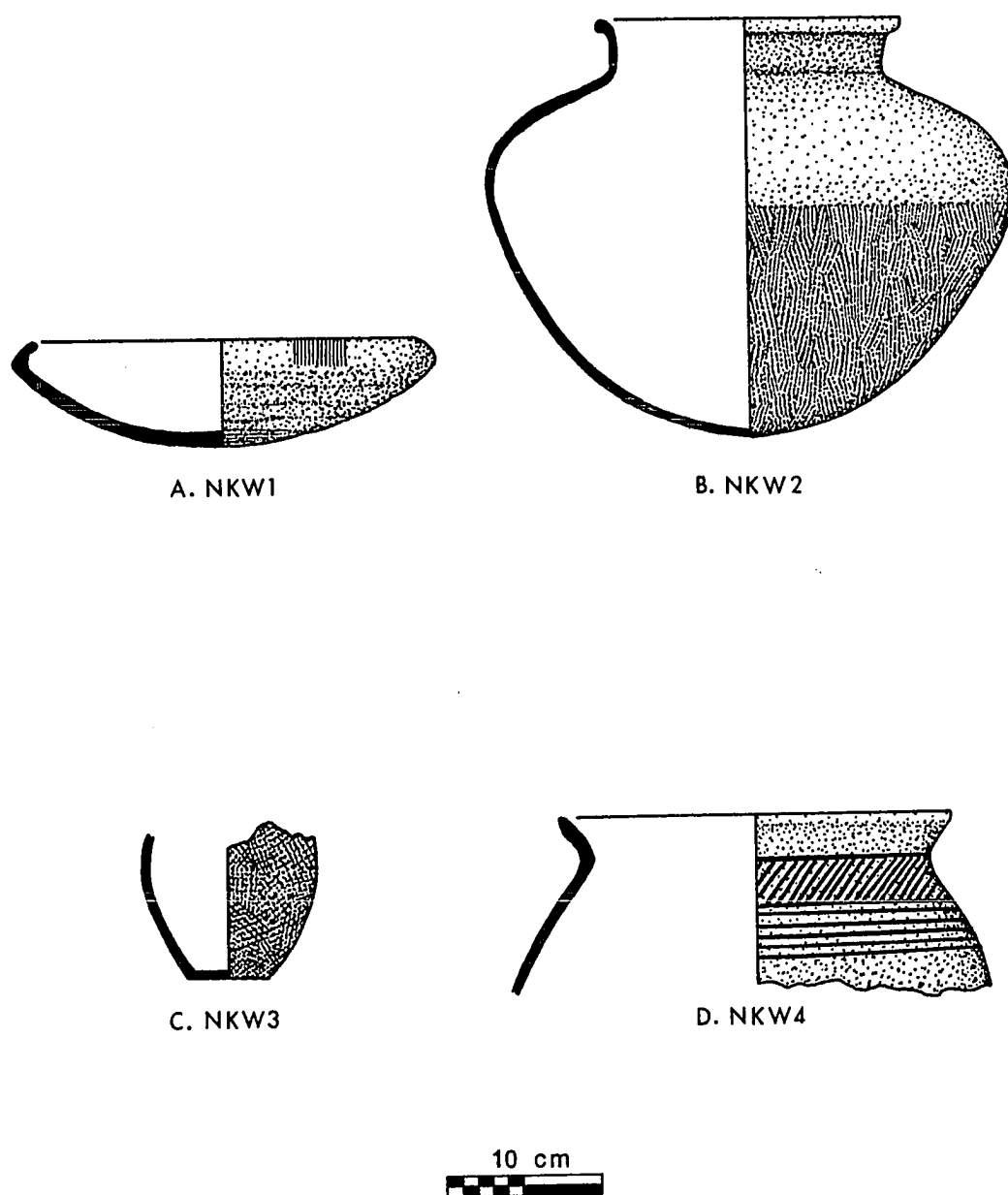


Figure 5-1. Non Khaw Wong reconstructed vessels.

impressions was applied around the circumference. This lid is strikingly similar in appearance to lids with black painted lines found at Don Klang (Schauffler 1976: Figures 3 and 4).

NKW2. This somewhat heart-shaped pot (Figure 5-1B) has a curved, everted rim which is slightly thickened at the lip. The vessel is more than two-thirds present. The reconstructed overall height is 25.5 cm. The diameter at the lip of the rim is 19.4 cm and the maximum diameter is 33.5 cm. Wall thicknesses are; lip of rim .8 cm, rim .7 cm, and body .4-.6 cm. The vessel is tempered with sand. The rim, and the body to a line just below the maximum diameter, are smoothed. The lower area of the body has rather randomly applied cord-wrapped paddle impressions.

NKW3. This ceramic is a single fragment of the base of a small pot (Figure 5-1C). Primary temper is siltstone fragments. The maximum body diameter is 11.0 cm and the vessel is 7.0 cm high from the base to the maximum body diameter. The pot has a flat base with a diameter of 5.8 cm. Thickness of the body is .4 cm and of the base is .5 cm. The extant body has cord-wrapped paddle impressions and the base is smooth.

NKW4. This ceramic is a fragment (reconstructed from four pieces) of the rim and upper body of a pot (Figure 5-1D). The rim is straight, everted, and slightly tapered. Wall thicknesses are; lip of rim .5 cm, rim .7 cm, and upper

body .5 cm. The diameter at the lip of the rim is estimated to be 25 cm. The interior of the rim has red paint while the exterior is smooth and plain. The smooth upper body has a geometric design in black paint.

Ban I Loet.

Six reconstructed vessels are from Ban I Loet. BIL1 is from Levels 7 and 8 (see Figure 4-2), and the remaining 5 are from Feature 2:

BIL1. This shallow basin-shaped lid (Figure 5-2A) is similar in shape to NKW1. It is nearly complete. The height of the lid is 4.6 cm. The diameter at the lip of the rim is 19.0 cm and the maximum diameter is 21.0 cm. Wall thicknesses are; lip of rim .6 cm, rim 1.0 cm, body .7 cm, and bottom .5 cm. Unlike NKW1, this lid has no decoration. The rim is smooth. The body has cord-wrapped paddle impressions which are smoothed-over around the maximum diameter.

BIL2. This very large pot (Figure 5-2B) has a curved, everted rim which has a "hooked" lip. This vessel is approximately half present and it is so large and thick that it is unlikely that any pieces have been overlooked. Reconstructed measurements include; height 80 cm, diameter at lip of rim 51 cm, and maximum diameter 60 cm. Wall thicknesses are; lip of rim 1.9 cm., rim 1.4 cm, upper body 1.0 cm, lower body .8 cm, and bottom 1.4 cm. The vessel is

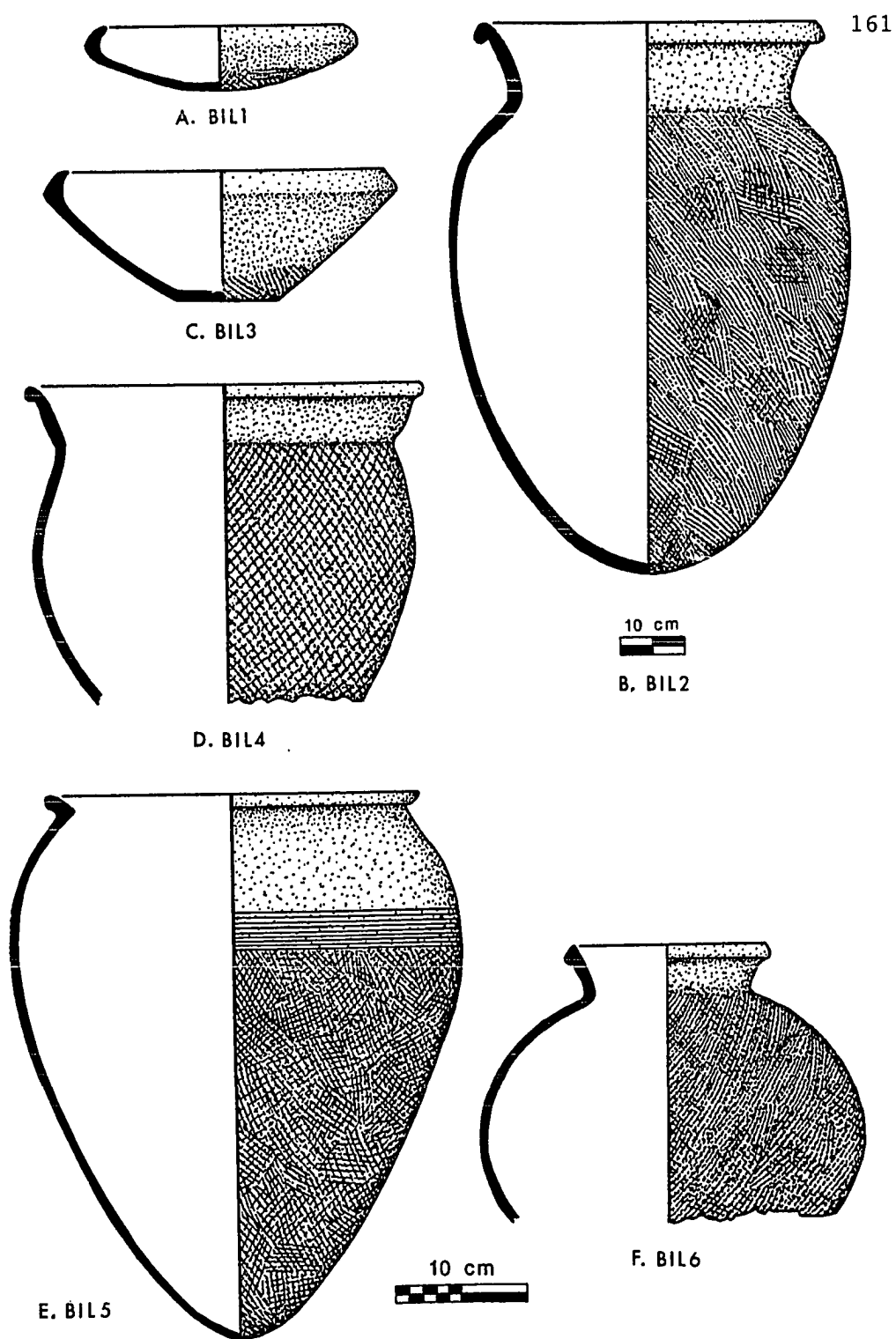


Figure 5-2. Ban I Loet reconstructed vessels.

tempered with a mixture of sand, siltstone, and slag. The rim is smoothed and the body has cord-wrapped paddle impressions.

BIL3. This shallow vessel (Figure 5-2C) has virtually straight sides, a flat base and an angular incurvate rim. It is thus distinctively different in shape from the lids NKW1 and BIL1. The flat base suggests that it may have functioned as a bowl rather than a lid. This vessel is more than two-thirds complete but the base is largely absent. It is tempered with fine sand. Vessel height is 9.6 cm. The diameter at the lip of the rim is 23.8 cm, the maximum diameter is 27.0 cm and the base diameter is 8.8 cm. Wall thicknesses are; lip of rim .4 cm, rim 1.4 cm, lower body .6 cm, and base .6 cm. The interior is smooth and has traces of red paint. The exterior is smooth except for a diagonally applied pattern of cord-wrapped paddle impressions around the circumference of the lower body.

BIL4. This pot fragment (Figure 5-2D) has a straight, everted rim with a flared lip. The diameter at the lip of the rim is estimated to be 30 cm and the maximum body diameter is estimated at 29 cm. The height is 13 cm from the maximum diameter to the lip of the rim, and if the body is globular, the total height would have been ca. 22 cm. Wall thicknesses are; lip of rim .8 cm, rim 1.0 cm, upper body .7 cm, and lower body .7 cm. The vessel is tempered

with a mixture of sand, laterite and siltstone. The rim is smooth and the body has cross hatched cordmarking.

BIL5. This somewhat heart-shaped vessel (Figure 5-2E) is approximately half present. It has a short everted rim with a slightly beaded lip. It is tempered with fine sand. Vessel height is 39.0 cm. The diameter at the lip of the rim is 28 cm and the maximum diameter is 34 cm. Wall thicknesses are; lip of rim .8 cm, rim .7 cm, upper body .6 cm, lower body .5 cm, and bottom .4 cm. The rim and the body down to the maximum diameter are smooth. The lower body has a series of parallel incised lines around the vessel just below the maximum diameter. Below the incised lines, the vessel has cross hatched cordmarking.

BIL6. This globular pot (Figure 5-2F) has a straight, everted rim with a "hooked" lip. The rim is almost entirely present but the lower body and approximately half of the upper body are missing. This suggests that the vessel was upside down when the upper levels of the feature were destroyed (see above). The vessel is tempered with fine sand. The height from the maximum diameter to the rim is 13.5 cm, and if the body is indeed globular, would be ca. 24 cm in total height. The diameter at the lip of the rim is 15.3 cm and the maximum diameter is 29.3 cm. Wall thicknesses are; lip of rim 1.2 cm, rim .8 cm, upper body .9 cm and lower body .5 cm. The rim is smooth and the body has cord-wrapped paddle impressions.

Ban Puan Phu

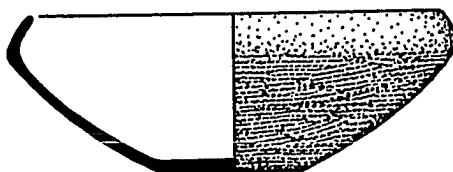
Two reconstructed vessels are from Ban Puan Phu. BPP1 is from Burial 1 and BPP2 is from Burial 2 (see Figure 4-5):

BPP1. This vessel (Figure 5-3A) is a fragment of a lid similar in shape to NKW1 and BIL1. It was found lying on the right side of the abdomen of Burial 1. The temper is fine sand. Estimated diameters are; lip of rim 22 cm and maximum 25 cm. Wall thicknesses are; lip of rim .7 cm, rim 1.3 cm, and body 1.0 cm. The rim is smooth and the body has cord-wrapped paddle impressions which are partly smoothed over.

BPP2. This vessel (Figure 5-3B) is a nearly complete bowl similar in shape to BIL3. It was found covering the face of Burial 2. The temper is fine sand. Height of the vessel is 9.2 cm. Diameters are; lip of rim 25.5 cm, maximum 26.5 cm, and base 8.5 cm. Wall thicknesses are; lip of rim .5 cm, rim .7 cm, body .6 cm, and base .7 cm. The interior of the vessel bears traces of red paint on both rim and body. The exterior of the rim is smooth and the body has cordmarking applied in a horizontal pattern around the circumference of the lower body. The base has smoothed over cordmarking.



A. BPP1



B. BPP2

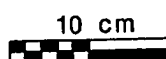


Figure 5-3. Ban Puan Phu reconstructed vessels.

Sherd Analysis

The remaining sherds from the excavations comprise more than 46,000 fragments which are presumed to represent broken vessels (and lids). Analysis of sherds was conducted with the goal of being able to reconstruct maximum information about the represented vessels within a reasonable amount of lab time. All rim sherds were coded. Rim sherds which were identified as probably, or positively, from the same rim were counted as one. Since a vessel has only one rim, this method of counting rim sherds approximates the numbers of represented vessels. The few recognized base sherds were also all coded. Decorated body sherds were coded. In this context, cordmarking was not considered to be decorative but a manufacturing technique. In fact, patterns of applied cordmarking do form decoration of a sort on some reconstructed vessels (above). However, it was impossible to sort cordmark decorative patterns systematically from ordinary cordmarking on small body sherds. The bulk of the sherds were plain and cordmarked body sherds. These were not coded due to the excessive amount of time required relative to the value of the data.

Temper

At Non Khaw Wong (NKG), 98.8% of the rim sherds are tempered with mineral grains (Table 5-1). Most rims

 Table 5-1. NKW percentage of tempers. n=523 (rims)

Fine sand	66.7	
<u>Other sand</u>	<u>8.6</u>	
Sand subtotal		75.3
Laterite	0.4	
Siltstone	8.8	
<u>Mixed minerals</u>	<u>14.3</u>	
<u>Other mineral subtotal</u>		<u>23.5</u>
All mineral subtotal		98.8
Untempered	1.0	
<u>Vegetable</u>	<u>0.2</u>	
<u>Other subtotal</u>		<u>1.2</u>
Total		100.0

(75.3%) are tempered with sand and fine sand is the single largest category (66.7%). A few untempered and vegetable-tempered rims are also present.

At Ban I Loet (BIL), 99.3% of the rims are tempered with mineral grains (Table 5-2). Fine sand is not prevalent as at Non Khaw Wong, but comprises about half of the sand-tempering found in 73.4% of the rims.

At Ban Puan Phu (BPP), 98.7% of the rims are tempered with mineral grains (Table 5-3). Here, fine sand is only 21.8% of the total although sand-tempering is present in about the same percentage as at the other sites (75.9%). Some non-mineral-tempered sherds are also present, including a prepared-clay-tempered sherd which is evidently a recent

 Table 5-2. BIL percentage of tempers. n=278 (rims)

Fine sand	37.8	
<u>Sand</u>	<u>35.6</u>	
Sand subtotal		73.4
Laterite	1.1	
Siltstone	9.7	
<u>Mixed Minerals</u>	<u>15.1</u>	
<u>Other mineral subtotal</u>		<u>25.9</u>
<u>All mineral subtotal</u>		<u>99.3</u>
Rice	.4	
<u>Vegetable</u>	<u>.3</u>	
<u>Other subtotal</u>		<u>.7</u>
Total		100.0

intrusion along with the stoneware found in this excavation (see Table 4-3).

Surface Treatment

The Non Khaw Wong rims are predominantly plain (86.2%). Burnishing and paint are the most common decorations (Table 5-4). Twenty-eight NKW rims had codable upper body present. The most frequent combinations are plain rims with cord-marked, plain, or burnished upper bodies (Table 5-5). Fifty-two NKW decorated body sherds were coded. These decorated body sherds are 9.9% of the number of rim sherds and suggest that approximately 10% of the represented vessels are decorated. The most frequent decorations on these sherds is

 Table 5-3. BPP percentage of tempers. n=849 (earthenware rims)

Fine sand	21.8	
<u>Other sand</u>	<u>54.1</u>	
Sand subtotal		75.9
Laterite	.6	
Siltstone	.1	
<u>Mixed minerals</u>	<u>22.1</u>	
<u>Other mineral subtotal</u>		<u>22.8</u>
<u>All mineral subtotal</u>		<u>98.7</u>
Prepared clay	.1	
Rice	.1	
Slag	.1	
<u>Untempered</u>	<u>1.0</u>	
<u>Other subtotal</u>		<u>1.3</u>
Total		100.0

 Table 5-4. NKW percentage of rim surface treatments. n=523

Smooth	77.4	
<u>Rough</u>	<u>8.8</u>	
Plain subtotal		86.2
Burnished	8.0	
Black paint	.2	
Red paint	1.4	
Other paint	3.6	
Impressed	.2	
Applique	.2	
<u>Incised</u>	<u>.2</u>	
<u>Decorated subtotal</u>		<u>13.8</u>
Total		100.0

 Table 5-5. NKW surface treatment of rim/body sherds. n=28

Body	Rim			
	Plain	Burnished	Impressed	Black Paint
Cordmarked	11	2		1
Plain	5		1	
Burnished	6			
Red Paint	1			
Slip	1			

smooth bands on cordmarked sherds, and incised designs on cordmarked, plain, and burnished sherds (Table 5-6).

The Ban I Loet rims are predominantly plain (90.2%). Burnishing and paint are important among decorations, as at

 Table 5-6. NKW decorated body sherds. n=52

Smooth band on cordmarked sherd	15
Incised on cordmarked sherd	16
Incised on plain sherd	6
Incised on burnished sherd	2
Incised on cordmarked and plain sherd	1
Incised on cordmarked and burnished sherd	2
Incised and impressed on burnished sherd	1
Incised and black paint on burnished sherd	1
Applique on cordmarked sherd	1
Applique on plain sherd	2
Modeled line on cordmarked sherd	1
Modeled line on plain sherd	1
Black paint on plain sherd	2
Black paint on burnished sherd	1

Non Khaw Wong. Here, incising appears as a minor decoration (Table 5-7).

Table 5-7. BIL percentage of rim surface treatments. n=278

Smooth	73.7
<u>Rough</u>	<u>16.5</u>
Plain subtotal	90.2
Burnished	4.0
Incised	1.1
Black paint	.4
Red paint	.7
Other paint	2.9
Smooth band	.4
<u>Cordmarked</u>	<u>.3</u>
<u>Decorated subtotal</u>	<u>9.8</u>
Total	100.0

Fifteen BIL sherds are large enough to code both rim and upper body (Table 5-8). Plain rims and cordmarked bodies are the most frequent combination.

Forty-five BIL decorated body sherds were coded (Table 5-9). These sherds are 16.2% of the rim sherds and suggest that approximately 16% of the represented vessels are decorated. The most frequent decorations are appliques, smooth banding over cordmarking, and incised designs on plain and cordmarked sherds. Appliques were not present in significant numbers at Non Khaw Wong.

The Ban Puan Phu rims have predominantly plain surface treatment (Table 5-10). Burnishing and painting are most

Table 5-8. BIL surface treatment of rim/body sherds. n=15

Body	<u>Rim</u>			
	Plain	Smooth band	Burnished	Other paint
Cordmarked	12	1		
Plain			1	
Smooth band on cordmark				1

Table 5-9. BIL decorated body sherds. n=45

Applique on plain sherd	16
Applique on cordmarked sherd	2
Smooth band on cordmarked sherd	6
Incised on plain sherd	9
Incised on cordmarked sherd	7
Incised on burnished sherd	1
Incised and impressed on plain sherd	2
Impressed on plain sherd	1
Black paint on plain sherd	1

Table 5-10. BPP percentage of rim surface treatments. n=849

Smooth	73.1
<u>Rough</u>	<u>19.8</u>
Plain subtotal	92.9
Burnished	1.3
Black paint	.1
Red paint	1.2
Other paint	3.8
Painted and incised	.1
<u>Incised</u>	<u>.6</u>
<u>Decorated subtotal</u>	<u>7.1</u>
Total	100.0

frequent among the rim decorations. Incised designs are present but not as frequently as at Ban I Loet. Fifteen rims had enough body to code (Table 5-11). The rims are all

Table 5-11. BPP surface treatment of rim/body sherds. n=15.

Body	Rim
	Plain
Cordmarked	7
Incised on cordmarked	1
Impressed on plain	6
Incised on plain	1

plain. Cordmarked upper bodies are common and include one with incised lines. A series of impresssions around a plain shoulder are also common. Notably absent here are the appliques which are a frequent decoration on body sherds at this site (below). Appliques evidently are not associated with the rim/shoulder areas of the represented vessels.

The 211 decorated body sherds which were coded for BPP (Table 5-12) are 25.0% of the rim sherds coded and suggest that approximately 25% of the represented vessels were decorated. This appears to be a significantly higher percentage than at Ban I Loet (16%) and more than twice that of Non Khaw Wong (10%). Notable in the decorations at this site is also a significant increase in applique decorations.

 Table 5-12. BPP decorated body sherds. n=211

Applique on plain sherd	97
Applique on cordmarked sherd	17
Applique on cordmarked sherd with smooth band	6
Applique on painted sherd	1
Smooth band on cordmarked sherd	28
Incised on plain sherd	19
Incised on cordmarked sherd	9
Incised on burnished sherd	1
Impressed on plain sherd	20
Impressed and modeled line on plain sherd	2
Impressed and incised on plain sherd	3
Stamped design on plain sherd	2
Modeled line on plain sherd	4
Red paint and smooth band on cordmarked sherd	2

Appliques were found on 121 sherds. The ratio of applique body sherds to rims is 14.2%. This suggests that approximately 14% of the represented vessels had appliques. Similar percentages are: Non Khaw Wong .6% and Ban I Loet 5.7%. There also appeared to be a qualitative difference in the applique designs at Ban Puan Phu, where they were more complex and varied.

Base sherds

No base sherds were identified from Non Khaw Wong, other than the reconstructed vessel NKW3 (above). At Ban I Loet, no base sherds were identified. Six earthenware bases were recognized from Ban Puan Phu. The six bases are less than 1% of the number of rim sherds (849). These data

clearly suggest that the vast majority of the represented vessels from these excavations had rounded bottoms.

Four of the BPP bases are plain flat bases and two are ring bases (Table 5-13). Of the flat bases, two were sand tempered, one was fine sand tempered, and one had mixed mineral temper. Of the ring bases, one had only minor amounts of mineral inclusions and is considered untempered and the second was fine sand tempered. The surface finish is predominantly rough, suggesting that finishing bases was not high priority for the potter.







Rim Form

A large number of rims from the excavations can be described in four clusters of common rim forms (Figure 5-4). These clusters account for a total of between 74.9 and 82.4% of the rims from the excavations (Table 5-14). Some other of the more common or more distinctive rim forms found in the excavations are shown in Figure 5-5 and their distribution is tabulated in Table 5-15.

Prehistoric Ceramic Summary

Clearly, the excavated ceramics are very similar between these three sites. Mineral tempering is found in very high percentages of the excavated pottery; Non Khaw Wong - 98.8%, Ban I Loet - 99.3% and Ban Puan Phu - 98.7%.

Table 5-13. Earthenware base sherds from Ban Puan Phu. n=6

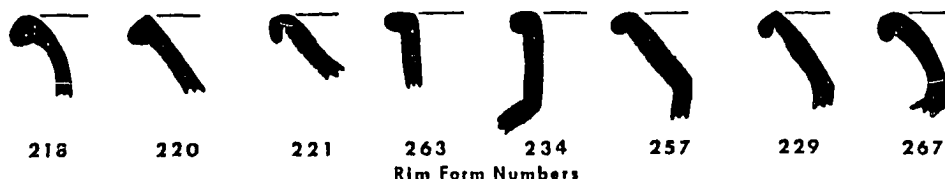
Provenience	Form	Temper	Surface
Level 2		Untempered	Rough
Level 3		Sand	Rough
Level 3		Sand	Rough
Level 3		Mixed Minerals	Cordmarked
Level 3		Fine Sand	Rough
Level 6		Fine Sand	Rough

Beaded rim cluster

177



General fragmentary forms; not oriented

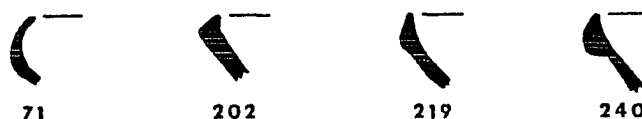


Rim Form Numbers

Bowl/lid cluster



General fragmentary form; not oriented



Rim Form Numbers

Restricted mouth cluster



Rim Form Numbers

Simple everted cluster



General fragmentary forms; not oriented



Rim Form Numbers

Figure 5-4. Common rim forms.

Table 5-14. Distribution of common rim clusters in excavations.

Rim Clusters	Excavated Sites					
	NKW 31.01-11		BIL 17.09-3		BPP 17.09-23	
	n	% of all rims (n=523)	n	% of all rims (n=278)	n	% of all rims (n=849)
Beaded	155	29.6	108	38.9	428	50.4
Bowl/Lid	82	15.7	53	19.1	102	12.0
Restricted	21	4.0	9	3.2	24	2.8
Simple Everted	134	25.6	59	21.2	146	17.2
Total	392	74.9	229	82.4	700	82.4

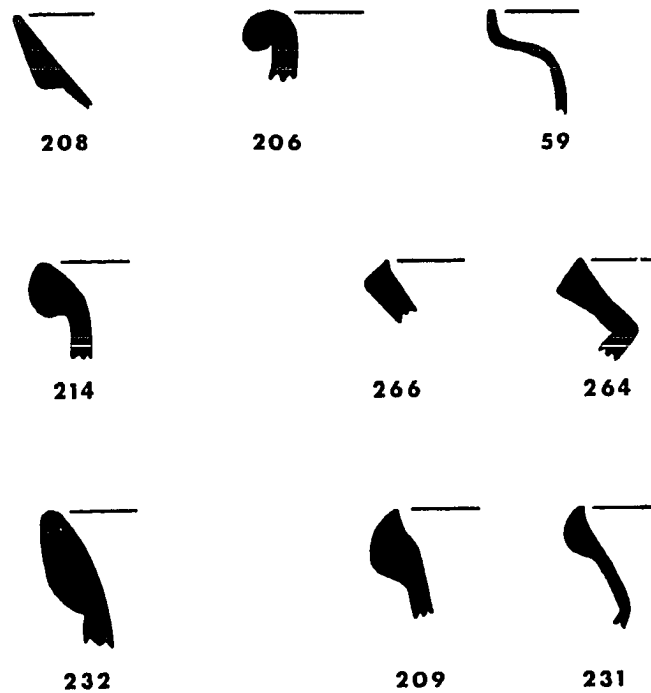
Flanged rim group**Folded rim group****Other distinctive forms**

Figure 5-5. Distinctive rim forms.

Table 5-15. Distribution of distinctive rim forms in excavations.

<u>Rim Forms</u>																			
Excavated Sites	Flanged Group					Folded Group												264	209
	203	262	227	253	33	56	292	297	226	213	208	206	59	214	266	232	231		
NKW 31.01-11	5		1				1	3	1	4	15	8		6	1	6	9		
BIL 17.09-3	1			1	1					1		4		2	1	2	2		
BPP 17.09-23	1	1	4	2	11	3		2	2	18		31	2	2	14				

A high percentage of the rims had plain finish; Non Khaw Wong - 86.2%, Ban I Loet 90.2% and Ban Puan Phu - 92.9%. Burnishing and paint are also significant rim surface finishes; Non Khaw Wong - 8.0% and 5.2%, Ban I Loet - 4.0% and 4.0% and Ban Puan Phu - 1.3% and 5.1%. A large majority of the rims can be described in four clusters of common forms: beaded, bowl/lid, restricted, and simple everted. Some other distinctive rim forms are also found in all three excavations.

Some of the illustrated and unillustrated, distinctive and unique rim forms may prove useful when more is known of their distribution. Internal distribution of some of the shared ceramic traits also promise interesting data for future research. Some examples are: (1) the percentages of fine sand temper in rim sherds is 66.7% for Non Khaw Wong, 37.8% for Ban I Loet, and 21.8% for Ban Puan Phu, (2) the percentages of applique decorations on the represented vessels were estimated to be 1% for Non Khaw Wong, 6% for Ban I Loet, and 14% for Ban Puan Phu, and (3) the percentage of beaded rims to all rims is 30% for Non Khaw Wong, 39% for Ban I Loet, and 50% for Ban Puan Phu. It is, of course, necessary to have large comparative collections to make use of this data. Also, it is impossible to state at present whether these variations are temporal or geographical (or both), since the three excavated sites represent both temporal and geographical spans.

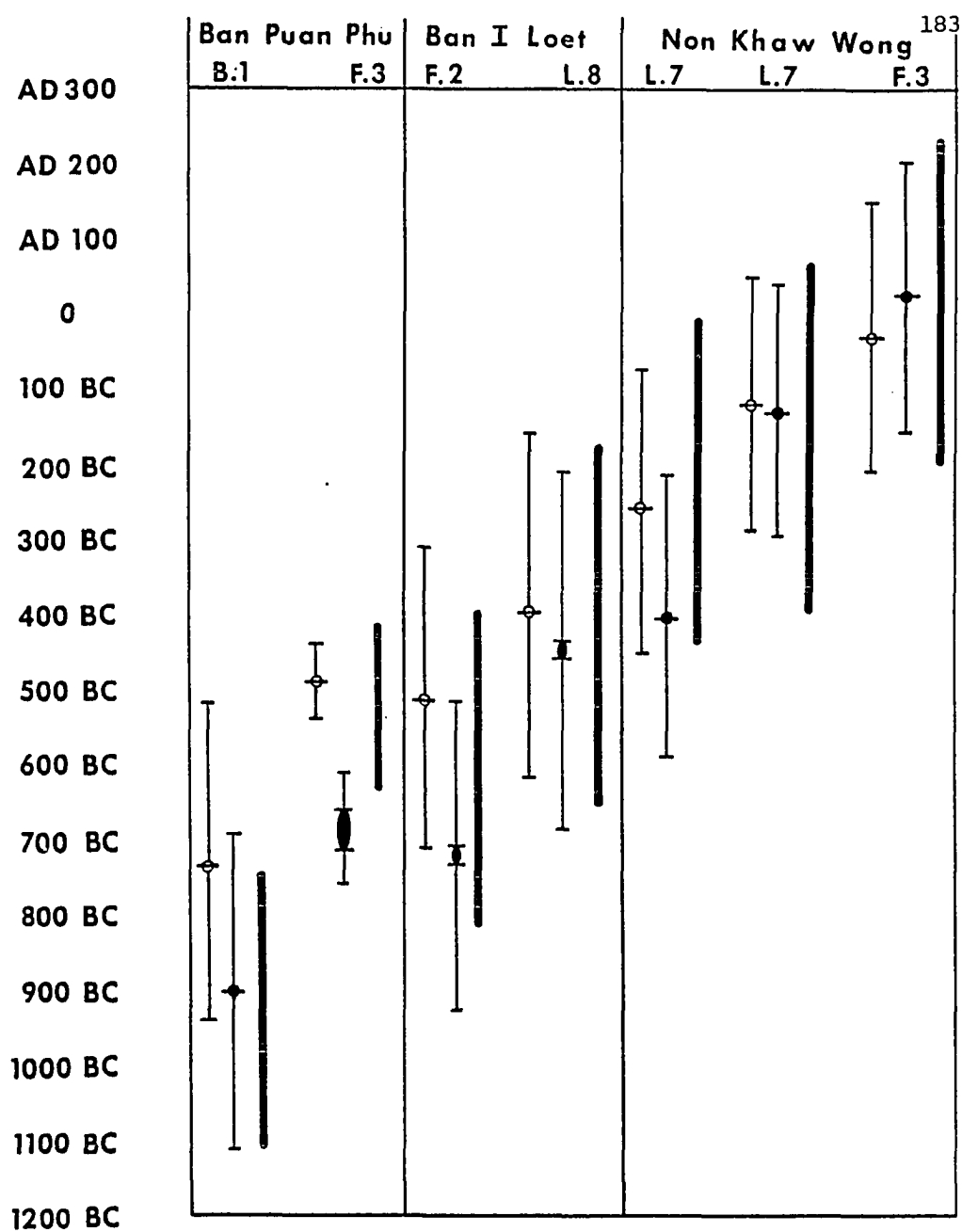
Given the very strong similarities and the absence of presently useful variations, these ceramics are treated as a single complex which is termed Phu Kradung ceramics in the following discussions.

Cultural Sequence

Radiocarbon Dates and Excavated Ceramics

The radiocarbon dates reported in Chapter 4 are presented graphically in Figure 5-6. A sequence of dates were obtained ranging from ca. 900 B.C. to ca. 0 B.C. (corrected dates). The dates clearly suggest that Ban Puan Phu is the earliest (ca. 900 - 500 or 600 B.C.), Ban I Loet the middle (ca. 600 - 400 B.C.), and Non Khaw Wong the latest (ca. 200 - 0 B.C.) of the sites. Most of the dates, however, have rather large one-sigma error ranges and it is not possible to be precise about their temporal spans. In particular, it is not possible to state positively if the sites were occupied contemporaneously during some part or parts of their temporal spans.

Given the series of overlapping radiocarbon determinations, the ceramic similarities described in the preceding section take on additional meaning. Because of the clustering of both dates and ceramic traits, the excavated sites are considered here to represent a cultural cluster of sites dating to ca. 900-0 B.C. The strongly defined traits of the






 Radiocarbon years ± 1 sigma
 Original corrected date ± 1 sigma
 (elongated oval = range of corrected date)
 CRD 1 sigma corrected date

Figure 5-6. Radiocarbon dates.

excavated Phu Kradung ceramics can be used to define the cultural affiliation of ceramics collected from other survey sites.

Temporal Analysis of Survey Sites

Ceramic evidence is the basis for analysis of the temporal affiliations of the survey sites. Some sites which did not yield ceramics can be placed in time by other evidence. The division of sites into periods is described here.

Phu Kradung Ceramic Sites

Many of the rim sherds collected from other survey sites had mineral temper, and plain, burnished or painted finish like the excavated ceramics. Table 5-16 shows the distribution of the common rim clusters and some distinctive rim forms (see Figures 5-4 and 5-5) for these rims. Two miscellaneous sites (22.01-9 and 31.01-4) which were recorded by this survey but outside the formal survey squares are included in Table 5-16 (see Appendix B). Fifteen collections from the unexcavated sites had beaded rims and/or a combination of other rim forms. These collected ceramics have temper, surface finish, and rim forms strikingly similar to the excavated ceramics. These sites, thus, are identified as Phu Kradung ceramic sites and are so listed in Table 5-17

Table 5-16. Distribution of common rim clusters and some distinctive rim forms in surface collections.

		<u>Site Numbers</u>																			
Rim Clusters and Rim Form Numbers	16. 01-	17.09-										22.01-				31.01					31. 03-
	1	1	5	6	8	9	15	16	18	25	26	4	8	9	10	1	2	4	5	9	1
Beaded	5	5			10	3					11	2		4		1			1	5	
Bowl/Lid											1							1	1	6	
Restricted						1						1		1				1		1	1
Simple Everted	1		3	1	4	1	1	2	5	1	2	3	1	2	2	2	1	4	3	3	12
56		1																			
292														1							
213											1										
59						1								2							
214						1															
264/266	1																			1	
209/231	2				1																

Table 5-17. Temporal analysis of survey sites.

<u>Phu Kradung Ceramic Sites</u>	<u>Prehistoric-Unassigned Sites</u>	<u>Historic and Recent Sites</u>
16.01-1	17.09-5	17.09-2
17.09-1*	17.09-6	17.09-4
17.09-3*	17.09-11 ^p	17.09-7
17.09-8	17.09-13 ^p	17.09-10
17.09-9	17.09-14(?)	17.09-12
17.09-15*	17.09-16	17.09-18
17.09-23*	17.09-21	17.09-19
17.09-25	17.09-26 ^p	17.09-22
22.01-4	22.01-3	17.09-24
22.01-8	22.01-11(?)	22.01-5
22.01-9 ⁺	31.01-6 ^p	22.01-7
22.01-10	31.01-7(?)	31.01-2
31.01-1	31.01-8	31.01-3
31.01-4 ⁺	31.01-12	31.01-10
31.01-5		31.03-2
31.01-9		
31.01-11*		
31.03-1		
<p>* = Excavated site + = Site not in formal survey square p = Rock paintings</p>		

along with the excavated sites. One of the listed sites (22.01-10) also has stoneware but this is considered to represent later reoccupation.

Prehistoric-Unassigned Sites

Some other sites are believed to be prehistoric but are not assigned to a particular period for reasons described here. The simple everted rims are not considered to be sufficiently distinctive to place a site in the Phu Kradung cluster without corroboration. This is partly due to the very simplicity of their form and partly due to the fact that some simple everted forms with similar temper and surface finish are also found in apparent historic contexts (see below). Six sites in Table 5-16 have only simple everted rims. Four of these sites (17.09-5, -6, -16, and -26) have no historic material present and are listed as prehistoric-unassigned in Table 5-17. Five other sites had no rim sherds but the body sherds had characteristics similar to other prehistoric sherds. These sites (17.09-13, -21, 22.01-3, 31.01-8, and -12) are also listed in this unassigned category. Though the actual evidence is slight, the rock paintings appear to be prehistoric. Two sites already listed as prehistoric-unassigned have them and two sites (17.09-11 and 31.01-6) which have paintings but no evidence of occupation are added to the list. Two further sites (17.09-14 and 22.01-11) have been virtually destroyed

by construction and are tentatively ("?") assigned to the prehistoric category based on interviews with informants. Site 31.01-7 yielded only one cordmarked sherd which appears to be prehistoric. A burial was found on this site but given the lack of evidence for a prehistoric deposit, the burial could be of any age. This site is also tentatively assigned to the prehistoric category.

Historic and Recent Sites

Two of the six sites in Table 5-16 which had only simple everted rims are included here. One (17.09-18) has stoneware and porcelain, and is listed as historic. Another (31.01-2) is considered to be recent based on the presence of a prepared-clay-tempered sherd. A series of other sites (17.09-7, -10, -12, 22.01-5, -7, 31.01-3, -10) are listed as historic or recent based on the presence of stoneware, porcelain, or recent ceramics (Table 5-17). The six remaining sites from the survey squares are historic or recent, based on other evidence. The stone monument (17.09-22) is clearly historic. The jar burial sites (17.09-2 and -4) represent historic Buddhist practice. The smelting sites (17.09-19, -24, and 31.03-2) are not dated but appear to be recent based on the superficial nature of the remains. Partially standing remains of what must have been similar small smelting furnaces were observed by our survey party in central Loei Province where an informant described their

operation. A "cottage industry" in smelting iron was apparently operational in some parts of Thailand up until about the time of World War II.

Summary

Ceramic similarities described in this chapter clearly define a cluster of sites involving the excavated sites and fifteen of the other sites from the survey. Radiocarbon dates from the excavations indicate that these sites date to a period ca. 900 - 0 B.C. A number of other sites are believed to be prehistoric but have too few ceramics to make a clear judgement about their affiliation with the Phu Kradung ceramic sites. Given the total absence of evidence for other prehistoric periods, it seems most likely that the unassigned sites are also part of the same prehistoric cluster of sites. All other sites recorded by the Petchabun Piedmont Survey are historic or recent. Present evidence for the cultural sequence for the survey area indicates that the major, and perhaps the only, prehistoric occupation is in the first half of the iron age village farming period (Figure 1-2). There is no evidence whatsoever for a Hoabinhian or transitional occupation in the survey area. The survey area has a cultural sequence which is quite different from that expected (see Chapter 1). The question of how the cultural sequence from the survey area fits into the pre-

history of Northeast Thailand and surrounding regions is taken up in the next chapter.

CHAPTER SIX

GEOGRAPHY OF PREHISTORIC SITES

Introduction

In this chapter, we turn to consideration of the distribution of sites within the Petchabun Piedmont Survey area and a comparison with surrounding subregions and regions. The distribution of sites according to environmental variables lies at the heart of the theoretical problem tested in this research (see Chapter 1). In the first section below, the description of the Petchabun Piedmont Survey is completed by consideration of the geographical distribution of the sites. Comparative literature is then discussed following the scheme of subregions and regions described in Chapter 2.

The Petchabun Piedmont Survey Sites

As described in the preceding chapter, ceramic similarities demonstrate that all sites with sufficient ceramic data can be placed in the first half of the iron age village farming period. It is interesting that the limited rimsherd data for variation among the ceramics (see Chapter

5) do not indicate any internal geographical clustering. For example, the distinctive rimform represented by numbers 264 and 266 (Figure 5-5) is found more frequently in the earliest dated excavation at Ban Puan Phu which is at the north end of the survey, but these forms are also found in surface collections from two other sites in central and southern areas of the survey. Thus, there is no initial suggestion of "diffusion" across the area during the period.

Another significant point concerning the relation of temporal to geographical distribution can be made by comparing Table 6-1 with Table 5-17. All but two open sites have identified Phu Kradung ceramics, but only three cave sites are so identified. In general, this is because the cave sites yielded few ceramics, often too few to be classified. Thus, there is no reason to believe that the cave sites have different ceramics. They are merely a class of sites which generally have few ceramics. There is no evidence for any other cultural/temporal period among the prehistoric piedmont sites. This situation appears to result from quite different utilization of these sites. The excavated open sites have evidence of occupation (dense sherd deposits; post holes), metallurgy (slag; crucibles), cloth manufacture (spindle whorls), hunting (clay balls) and inhumation burials. Other recorded open sites appear to be similar based on limited survey data. The cave sites generally had shallow deposits which yielded little. Excavations

Table 6-1. Geographical data for Petchabun Piedmont Survey prehistoric sites.

<u>Site No.</u>	<u>Type</u>	<u>Zone</u>	<u>Elevation(m)</u>	<u>Geology</u>	<u>Soil</u>
17.09-11	Cave	8	390	R	S
17.09-13	Cave	8	390	R	S
17.09-14	Cave	8	360	R	S
17.09-15	Cave	8	360	R	S
17.09-16	Cave	8	360	R	S
17.09-21	Cave	8	370	R	S
17.09-26	Cave	8	350	R	S
22.01-3	Cave	8	260	R	S
22.01-8	Cave	8	260	R	S
22.01-10	Cave	8	300	R	S
22.01-11	Cave	8	260	R	S
31.01-6	Cave	8	390	R	S
31.01-7	Cave	8	320	R	S
31.01-8	Cave	8	330	R	S
31.01-12	Cave	8	280	R	S
16.01-1	Open	3	260	PKD	-
17.09-1	Open	3	270	PKD	RBL
17.09-3*	Open	3	255	PKD	RBL
17.09-5	Open	3	260	PKD	RBL
17.09-6	Open	3	260	PKD	RBL
17.09-8	Open	3	250	PKD	RBL
17.09-9	Open	3	250	PKD	RYP
17.09-23*	Open	3	330	R/PKD	RBL
17.09-25	Open	3	330	R/PKD	RBL
22.01-4**	Open	3	250	R	A
22.01-9	Open	2	230	R	RYP
31.01-1**	Open	3	240	R	GP&RYP
31.01-4	Open	3	230	R	GP
31.01-5	Open	2	235	R	BFS
31.01-9*	Open	3	300	R	R
31.01-11*	Open	3	260	R	GP
31.03-1	Open	2	240	PKD	A

*=excavated site
 **=site outside formal
 survey squares

Geology abbreviations

R = Ratburi Formation
 PKD = Phu Kradung Formation
 R/PKD = transitional

Soil Abbreviations

S = Slope complex
 RBL = Reddish-Brown Lat.
 RYP = Red-Yellow Podzolic
 A = Alluvial
 GP = Gray Podzolic
 BFS = Brown Forest Soils
 R = Redzinas

in one cave site (17.09-26) by Thai archaeologists recovered only a few sherds, a stone tool, shell, and bone. Compared to the open sites, the cave sites appear to have been used for short periods and for limited activities. Judging from these data and from observations made in the field, it appears that the open sites were the main living and working sites, and that the cave sites were temporary camps. It appears likely, then, that the prehistoric cave and open sites are contemporary elements of a settlement system.

Table 6-1 summarizes environmental data for the prehistoric sites. All these sites are in the same rainfall zone (ca. 1250 mm per year) and all have proven or probable access to water. The table is simplified by not listing these two variables.

All cave sites are associated with the Ratburi Formation. Many other caves in this formation were explored but not recorded as sites. This limestone formation has numerous solution cavities which form caves and rock-shelters. Caves are rare in sandstone formations (no such sites were found in this survey), although in some areas a soft shale stratum erodes out leaving a sandstone overhang (Solheim and Gorman 1966:116).

The prehistoric open sites seem to be distributed across all the geological zones and several of the soils present in the survey area. The prehistoric open sites do have one common trait other than access to water and sharing

the same rainfall zone. All are at elevations (235-330 m) which closely correspond to the lowlands of their respective areas. In topographic terms, this means that most of the sites are in river valleys. Away from the hills, the lowlands are much broader but even here there seems to be a tendency for sites to be distributed along rivers. Most of the prehistoric open occupation sites are on terracelands (zone 3) and two are in ricelands (zone 2). It should be stressed that the strong terraceland site distribution does not reflect a distribution away from riceland. Ricelands are simply more restricted in the piedmont and there is a strong tendency for sites to be on terracelands bordering ricelands rather than to be surrounded by extensive ricelands which is the more common pattern out on the plateau (Higham 1975a; Kijngam et al. 1980). There are, however, two notable exceptions to the close correlation of sites with ricelands in the survey area. One of the excavated sites (Non Khaw Wong) and one other prehistoric site (16.01-1) are located in narrow highland valleys which have no ricelands, at least under current practice of rice agriculture in the survey area. These sites appear to be no different than the other open sites and one can only speculate on the significance of their location.

In summary, there is good reason to believe that all Petchabun Piedmont Survey prehistoric sites pertain to the same late prehistoric period (ca. 900 - 0 B.C.) and have two

general geographical orientations. Sites are found in caves and rockshelters of the Rathuri Formation limestone highlands. These appear to be temporary camp sites. Open sites are found in the lowlands along the plains edges and up into mountain valleys. These appear to be general occupation sites and are strongly oriented to locations near ricelands (terrancelands or ricelands zones), although two sites are known from highland valley situations.

The Petchabun Piedmont Subregion

It is necessary to introduce a few other sites in order to complete description of the Petchabun Piedmont subregion (Figure 6-1). The Pa Mong Survey (Bayard 1980b) recorded numerous sites in areas which can be considered here as Petchabun Piedmont. These are the Tha Li sites and the Loei sites west of the Loei River (Bayard 1980b:Map 2). However, most of these sites are historic. Four open Pa Mong sites (L66, L66A, L70 and L71) are prehistoric and proved to be important to discussion of piedmont sites. Four Pa Mong cave sites (L11, L12, L13 and L14) also yielded some prehistoric sherds. The Lam Phra Plerng (also spelled Lam Pla Plerng) Survey was one of a series of small surveys conducted in Northeast Thailand by Solheim and Gorman (1966: 115-123). This survey was for a dam in a narrow valley flanked by bluffs near the southern end of the Petchabun range. Two prehistoric sites were recorded by Solheim and

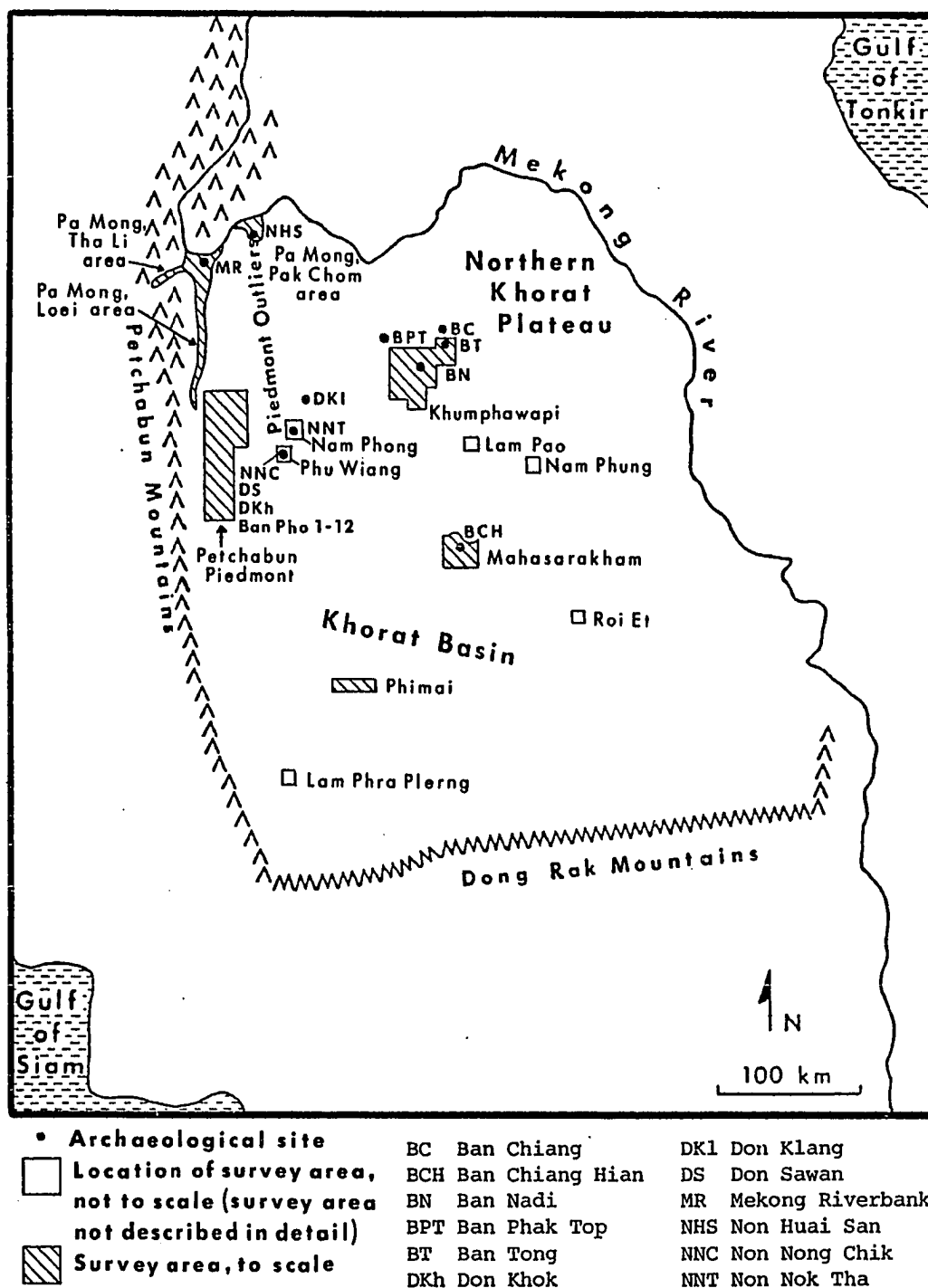


Figure 6-1. Archaeological sites and surveys in Northeast Thailand.

Gorman, and a third site was recorded the following year (Solheim and Ayres 1979:66).

Surface collections from four Pa Mong sites (L66, L66A, L70 and L71) clearly fit with the Phu Kradung ceramics. Bayard (1980b:70) describes two applicable wares: Na Ngua Buff and Non Bua Red wares. Na Ngua Buff is buff to gray in color, tempered with coarse sand and laterite, and normally has a cordmarked body and plain shoulder. The most common rim form is a rolled everted bead (Bayard 1980b:Figures 8 and 9). Inexplicably, the rims are drawn as inverted in Bayard's Figure 9. The rims in the plate (Bayard's Figure 8) are quite clearly everted as are the Phu Kradung beaded rims. Nong Bua Red ware is reddish to yellowish, tempered with fine sand, and is cordmarked or plain. This ware includes simple vertical and inverted rims in the form of shallow plates and bowls (Bayard 1980b:Figures 8 and 9). Both these wares are clearly similar to the Phu Kradung ceramics excavated by the Petchabun Piedmont Survey (see Chapter 5). Na Ngua Buff ware was found in the surface collections from L66, L66A, L70 and L71, and Nong Bua Red ware was found on L70 and L71.

The four Pa Mong prehistoric open sites (Bayard 1980b: 45-48) are all lowland sites, like the open sites in the Petchabun Piedmont Survey area. The L66/66a area is specifically described as being on the Loei River bank, and L71 is described as a mound. Also like the piedmont survey

sites, these four Pa Mong sites evidence occupation based on their brief descriptions.

These four Pa Mong sites are at the extreme southern end of the Loei survey area, which is nearly contiguous with the north end of the Petchabun Piedmont Survey. The combined distribution of prehistoric open sites is very interesting (Figure 6-2). In particular, there is an abrupt "edge" to the distribution at the north end of the piedmont survey and the southern end of the Pa Mong Survey. No prehistoric open sites were found by the Pa Mong Survey north of L66 and none were found in three survey squares in the northeast of the Petchabun Piedmont Survey. On the east and south, the distribution is not clearly defined but does still fit the pattern. The two sites recorded out of the formal piedmont survey squares lie to the east and indicate that these sites extend in that direction. However, sites only about 30 km further east in the Phu Wiang and Phu Kao area have quite different ceramics (see the discussion of the Piedmont Outliers subregion, below). Only one site was found in the two southernmost survey squares. This suggests that this site is near the southern edge of the distribution. This pattern strongly suggests a geographical cluster of roughly contemporary sites which share numerous traits. The presently defined geographical area is approximately 100 km from north to south and extends 20-30 km east from the main mass of the Petchabun mountains.

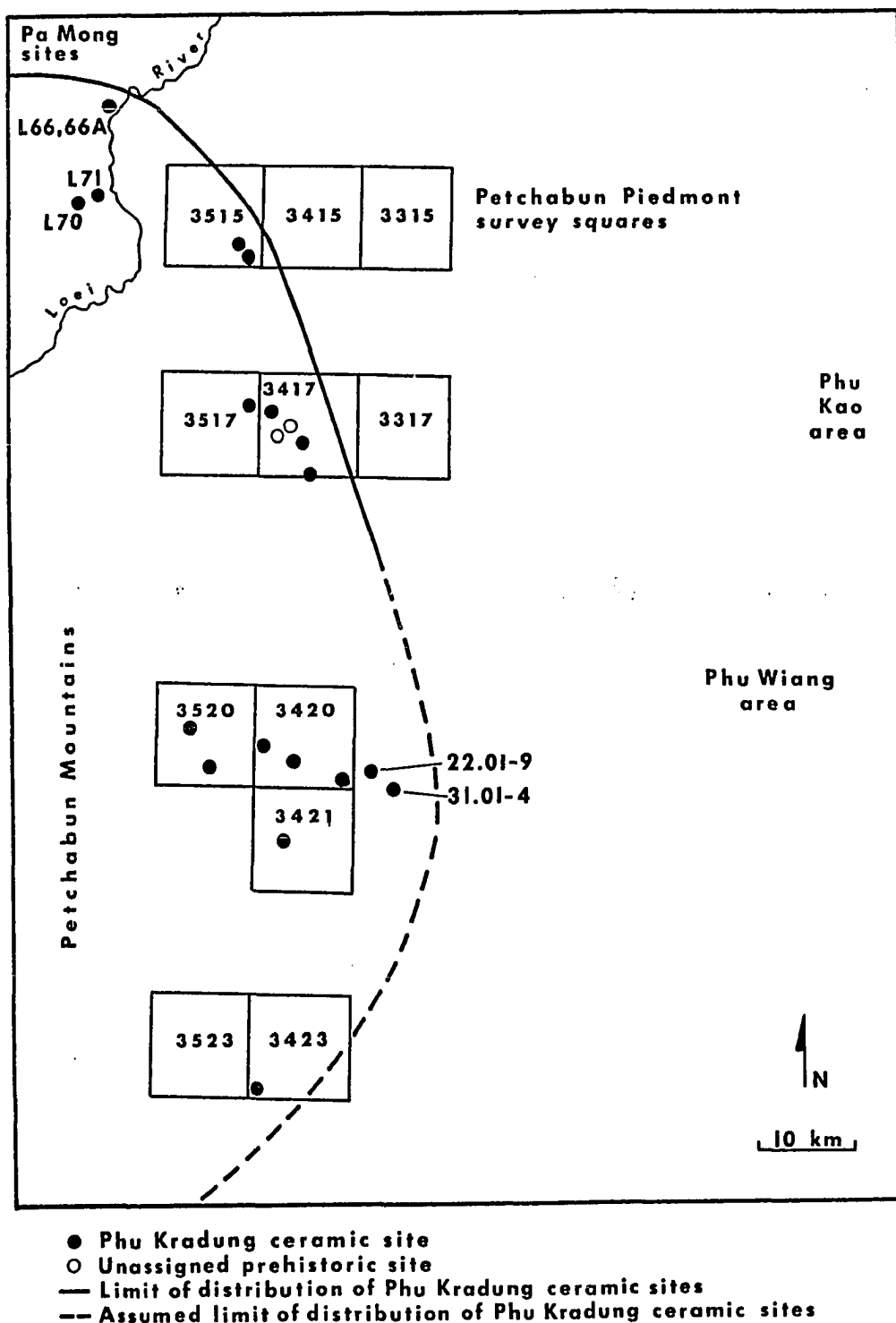


Figure 6-2. Distribution of Petchaban Piedmont prehistoric open sites.

Cave sites are more widely distributed in the piedmont but unfortunately there is too little data to say much about their distribution. Four Pa Mong cave sites (L11, L12, L13, and L14) yielded some ceramics. In the L11-13 complex, "the few [sherds] found by the surveyor appear to be a mixture of prehistoric and historic ware" (Bayard 1980b:28). At L14, two cordmarked sherds were found (Bayard 1980b:28). These would be classed as Prehistoric-Unassigned following the logic discussed in Chapter 5. These cave sites are in limestone outcrops in central and northern Loei areas where open sites recorded by the Pa Mong Survey are all historic. The cultural affiliation of these sites is simply not known at present.

The three Lam Phra Plerng sites are in sandstone overhang rockshelters and are described as "small way stations or temporary shelters" (Solheim and Gorman 1966:123). The ceramics from these sites seem to form a cluster of their own. Some of the pottery is sand tempered, and plain and cordmarked with some appliques. These sherds could be similar to some Phu Kradung ceramics. However, other sherds have dissimilar traits; carved paddle surface treatment, and fiber and prepared clay tempering. A radiocarbon date of A.D. 500 from one of the three sites gives a rough idea of their age (Solheim and Ayres 1979:66). Interestingly, this date is in the gap between the latest date associated with the Phu Kradung ceramics and the beginning of the historic

period. Unfortunately, there is not sufficient data to even guess if the ceramic variation is temporal, geographical, or both.

The Petchabun Piedmont, then, has a cluster of open sites with distinctive Phu Kradung ceramics found in an area thought to be ca. 100 x 30 km along the central part of the subregion. Open occupation sites are located in lowlands, mainly along streams and rivers. Most of these are associated with riceland, although two were found in upland stream valleys with no nearby ricelands. Cave sites in this area appear to be culturally and temporally related to the open sites. The Lam Phra Plerng cave sites to the south have a first millennium A.D. date and have distinctive ceramics. The northern Loei cave sites are of unknown cultural affiliation. Again, there is no evidence of Hoabinhian or hypothetical transitional period sites in the Petchabun Piedmont.

The Northeast Thailand Region

One of the major goals of the Petchabun Piedmont Survey was to make a contribution to regional archaeology in Northeast Thailand. The piedmont survey and some other archaeological work have now defined the general nature of prehistoric occupation along the western, Petchabun Mountain borders of the region. Here, literature for other sites in Northeast Thailand is reviewed in order to complete the

picture of regional prehistory. The interior of the Petchabun Mountain subregion, and both the mountains and piedmont along the Dong Rak Mountains are blank areas in terms of presently known sites. Thus, the Piedmont Outliers, Northern Khorat Plateau and Khorat Basin subregions remain to be considered here.

Piedmont Outliers Subregion

A number of known prehistoric sites are scattered around this subregion in the northwestern corner of the region (Figure 6-1). The Pa Mong Survey (Bayard 1980b) recorded numerous sites which are considered here to be in the piedmont outliers. These are the Pak Chom sites and the Loei sites east of the Loei River (Bayard 1980b:Map 2). As in the piedmont, most of these sites are historic. Only seven are prehistoric. Other work took place around and between two of the sandstone monadnocks which rise above the plains in this subregion. These are Phu Wiang and Phu Kao (see Figure 3-1). The Nam Phong Survey conducted by Solheim and Gorman (1966:164-179) covered an area which lies between Phu Wiang and Phu Kao. Four prehistoric sites were among those recorded by the Nam Phong Survey. Subsequently, one of these (Non Nok Tha) was extensively excavated (Bayard 1971a, 1971b). Some other archaeological work was conducted by Higham and Parker (1970) on the low plain within the arms of Phu Wiang which is an unusual "ring mountain" (see Figure

3-1). This work included test excavations at Non Nong Chik and Don Sawan, and a survey in the Ban Pho vicinity. Excavations were also conducted by Schauffler (1976) at Don Klang near Phu Kao.

Among these outlier sites, one stands out in relation to the quest for data on Hoabinhian occupation. This is the Mekong Riverbank site excavated by the Pa Mong Project (Bayard 1980b:99-123). This site is a lithic workshop located in the bank of the Mekong River (Figure 6-1). The prehistoric assemblage included Hoabinhian flaked stone tools, ceramics, and groundstone (adzes, adze blanks, a bracelet fragment, and discs). This assemblage is characteristic of the modified Hoabinhian period which could date anywhere from 7000 B.C. to A.D. 1000. No radiocarbon dates were obtained for the site. Unfortunately, however, this does not represent the sort of sites which were expected (Chapter 1). First, as a modified Hoabinhian site, it is too late to represent a source of the hypothesized agricultural transition. Second, the only other prehistoric sites in the vicinity are late prehistoric or historic, and thus, the Mekong Riverbank site cannot be placed in a sequence which is useful in relation to agricultural transitions. Third, the location is anomalous in terms of our present information about Hoabinhian site distribution. The only other known open Hoabinhian sites are shell middens in a few coastal areas (see Gorman 1971:306). This site is

important in general discussions of Hoabinhian site distribution (Chapter 7), but does not help here.

Prehistoric cave sites are known in the outliers subregion but none have Hoabinhian occupation. The Pa Mong sites include four caves in limestone outcrops; two in the Pak Chom area (PC7 and PC13), and two in the Loei survey area (L16 and Tham Pha Ya). Three sandstone rockshelter sites have been reported in the Phu Kao/Phu Wiang area; Nam Pong 4 in Phu Kao, and Tham Mu Daeng (Nam Pong 9) and Ban Pho 12 in Phu Wiang. The two Phu Wiang sites have red stenciled hands as decorations and the Phu Kao site has carved geometric designs. The differential distribution of designs may prove significant. Given the general lack of data on these sites, one can only speculate if they are contemporary with the open sites considered next.

The remaining sites to be considered represent the village farming tradition. One site can be placed in the early village farming period. The series of Non Nok Tha dates has been controversial, but Bayard (1977:64) believes that there is "strong but not unequivocal support" for the early sequence and "that the various phases at Non Nok Tha should be dated as follows: Early Period, from ca. 3500 BC - 2500 BC; Middle Period 2500 BC - 200 AD; Late Period ca. 1000 AD to present." For our purpose, the Middle Period can be subdivided into early and late subphases. The early Middle Period (ca. 2500 - 1000 B.C.) is included in the

early village farming period. At present, Non Nok Tha appears to be unique in representing this period in the outliers subregion.

The iron age village farming period is represented by several sites in the Phu Wiang/Phu Kao area. The Non Nok Tha late Middle Period (Middle Periods 5-8; ca. 1000 B.C. to A.D. 200) is one representation of the period. Non Nong Chik yielded radiocarbon dates contemporary with Non Nok Tha Middle Periods 5-8 (Bayard 1977:Table 11). Don Sawan ceramics are closely related to those from Non Nong Chik (Bayard 1977:83-90) and can be included here. Don Klang has yielded a number of radiocarbon dates within the iron age (Hurst and Lawn 1984), but there is no published correlation with the ceramic sequence. Don Khok (Ban Pho 3) has an apparently prehistoric level with iron and iron slag (Higham and Parker 1970:41-43). One of the Pa Mong sites can also be tentatively included here. Non Huai San (PC10) yielded ceramics which are somewhat similar to Tak Det ware (Bayard 1980b:89-91). Tak Det ware is thought by Bayard (1980b:65) to be late prehistoric to early historic. Other known open sites cannot be assigned to a particular prehistoric period. Non Hin Tang (Pa Mong site L1) yielded only a few sherds which are not clearly prehistoric (Bayard 1980b:81-83). The other Pa Mong sites are clearly historic. Nam Phong 8 is prehistoric but is only represented by a small surface collection of sherds (Solheim and Gorman 1966:177-178). The

remaining Ban Pho sites are either historic, or are not described as to whether they are historic or prehistoric.

Non Huai San is particularly interesting with regard to the general geographical distribution of these open prehistoric sites. Other known open sites with Tak Det ware are along the Mekong River in Laos (Bayard 1980b:65; and see discussion of Laos region, below). About 80 km separates Non Huai San from L66, the northernmost of the Phu Kradung ceramic sites (Bayard 1980b:Map 2). Much of the intervening area has been systematically surveyed by the Pa Mong Project, and thus, there is clearly a geographical gap in prehistoric occupation between the Tak Det and Phu Kradung sites. Ceramics in the Phu Wiang/Phu Kao area appear dissimilar from both Tak Det ware and the Phu Kradung ceramics (compare Bayard 1977:61-90 with Bayard 1980b:65 and Chapter 5 of this volume). However, the lack of survey in the intervening areas prohibits description of how the Phu Wiang/Phu Kao ceramics are distributed in relation to prehistoric sites west and north of that area.

All the known prehistoric open sites in the Phu Wiang/Phu Kao area are lowland sites. In particular, Non Nok Tha and Non Nong Chik are riceland (zone 2) sites (see Higham 1975a:Figures 4, 5 and 6). Don Sawan (Higham and Parker 1970:36) and Don Khok (Higham and Parker 1970:41) are both described as mounds on the low interior plain of Phu Wiang. Since about half of that area is in wet rice cultivation, we

can assume that these sites are in, or near, riceland. The immediate environment of Don Klang and Nam Phong 8 are not described. To the north in the Pa Mong survey area, Non Hin Tang is described as a mound and lies in the Loei River valley (Bayard 1980b:81). However, Non Huai San presents a different picture. This site is located on the end of a ridge extending out from the base of rugged mountains, and it is specifically mentioned that there is relatively little rice grown in the area (Bayard 1980b:89).

All the excavated open sites appear to have at least some evidence of occupation (Bayard 1971a, 1971b, 1980b; Schauffler 1976; Higham and Parker 1970) and post holes are specifically described for Non Nok Tha (Bayard 1971b:188-206) and Non Nong Chik (Higham and Parker 1970:33). Inhumation burials were found at Don Klang (Schauffler 1976:30-33), Non Nok Tha (Bayard 1971a), and Non Nong Chik (Higham and Parker 1970:34-35). Interestingly, iron slag is reported for all the excavated sites in the Phu Wiang/Phu Kao area; Non Nok Tha (Bayard 1981:697), Non Nong Chik (Higham and Parker 1970:35), Don Sawan (Higham and Parker 1970:37), Don Khok (Higham and Parker 1970:41) and Don Klang (Schauffler 1976:32). No slag is reported from the small excavations on the Pa Mong sites. Bronze working is represented by crucibles, casting moulds and casting spillage at Non Nok Tha (Bayard 1971a:37). Spindle whorls are reported from Don Klang (Schauffler 1976:32), Non Nok Tha (Bayard

1971a:34), Non Nong Chik (Higham and Parker 1970:35), and Don Sawan (Higham and Parker 1970:37). Non Nok Tha also has evidence of wild (hunted) and domestic animals (Higham 1975b) and rice agriculture (Bayard 1971a:32-33). Don Sawan was surrounded by a moat (Higham and Parker 1970:36). Granted the unevenness of reported data, it looks like the outlier open sites are, like the piedmont open sites, loci of occupation and a variety of other activities including at least burial, metallurgy, hunting, domestic animals, rice agriculture, and cloth manufacture.

Northern Khorat Plateau Subregion

Archaeological work in this subregion (Figure 6-1) includes excavations at Ban Chiang (Gorman and Charoenwongsa 1976; White 1982a), Ban Phak Top (Schauffler 1976) and Ban Tong (Schauffler 1976), and the Kumphawapi Survey (Kijngam et al. 1980). No Hoabinhian sites are known in this subregion, and they would not be expected given the plains topography.

The early village farming period is represented by several sites. The most recent review of Ban Chiang dating (White 1982a) places the Early Period from ca. 3600 to 1000 B.C. It can be noted that this dating lends support to the controversial "early sequence" at Non Nok Tha (see above). Radiocarbon dates from Ban Phak Top and Ban Tong range in the first to third millennium B.C. (Hurst and Lawn 1984).

However, only very brief descriptions are available for these two sites (Schauffler 1976). Initial occupation at Ban Nadi (Kumphawapi Survey field number 93) is about 1500 B.C., ie. late in the early village farming period (Kijngam 1984:41). However, even rough estimates of the dates for other Kumphawapi sites are not possible. The Kumphawapi Survey was designed based on the belief that surface ceramics could be cross dated by reference to ceramics from excavations elsewhere in the region (Ban Chiang, Non Nok Tha and so on). Unfortunately for this purpose, ceramic similarities are few and the Kumphawapi Survey prehistoric sites are not assigned to particular periods by the authors of the report (Kijngam et al. 1980: 12-19). Following excavation at Ban Nadi, many of these sites could probably be assigned to periods, but I am not aware that any such work has been published.

The iron age village farming period is represented by continuation of occupation at Ban Chiang (the Middle and Late Periods) (White 1982a), Ban Tong and possibly Ban Phak Top (Hurst and Lawn 1984), and Ban Nadi (Kijngam 1984:41). Again, many of the Kumphawapi sites could pertain here but cannot be so designated.

The lack of similarities between Kumphawapi surface ceramics and nearby excavated ceramics presents another picture of clustering of ceramic traits across the region. The famous Ban Chiang Late Period red-on-buff pottery is

found on numerous sites in this subregion judging from looted ceramics (Schauffler 1976). The general lack of survey in the intervening area makes it impossible to determine how these ceramic traits may be articulated.

Ban Chiang and Ban Phak Top are riceland (zone 2) sites (Higham 1975a:Figures 2, 3 and 8). Ban Tong is in a village but its environs are not described (Schauffler 1976:34-36). A series of environmental variables has been analysed for the Kumphawapi sites (Kijngam et al. 1980:59-66). Prehistoric settlement in that area is characterized by location in medium-quality riceland and near a water course.

There is evidence for a full range of activities on sites in this subregion. The excavated sites (excluding the salt-working site discussed below) all have evidence of occupation, and post holes are specifically mentioned at Ban Chiang (Gorman and Charoenwongsa 1976:20), Ban Tong (Schauffler 1976:36), and Ban Nadi (Kijngam 1984:37). The occupation sites also have inhumation burials (at Ban Phak Top the burials were not in the excavated area). Metallurgy is represented by iron slag at Ban Phak Top (Schauffler 1976:32), bronze-casting crucibles and molds at Ban Chiang (Gorman and Charoenwongsa 1976:20), and crucibles, partially smelted ore, mold fragments and bronze-casting furnaces at Ban Nadi (Higham 1981). Spindle whorls are reported from Ban Chiang (Suthiragsa 1979). Ban Chiang also has evidence of domestic animals and rice agriculture from the beginning

of the occupation (Higham and Kijngam 1979; Yen 1982). At Ban Chiang, the earliest attested domestic water buffalo coincide with early use of iron and environmental changes which together suggest the advent of a system of wet rice agriculture using iron plows and the buffalo for traction (Higham et al. 1981). If so, this is an important contribution to the history of an immensely important agricultural system. Again, in spite of uneven reporting, it is clear that these sites are loci of occupation, burial, and other activities.

Also of geographical interest is the presence of salt working sites in the Kumphawapi Survey area. Non Teeng Seeng (Kijngam et al. 1980:126-132) and several small steep mound sites in its vicinity (Kijngam et al. 1980:Table 2) are the result of salt making. The modern salt making process involves bringing salt-encrusted soil to the site and extracting a brine which is boiled down. These activities lead to a rapid build up of characteristic soil deposits. Apparently, the only significant difference between prehistoric and modern salt working deposits is the presence of pottery in the former (metal pans are presently used to boil the brine). A date of 1880±85 B.P. was obtained from Non Teeng Seeng (Kijngam et al. 1980:addendum to p. 128) and indicates that the salt working commenced during the iron age village farming period.

Khorat Basin Subregion

Prehistoric sites in this subregion are found in three survey areas (Figure 6-1); the Roi Et Survey (Higham and Parker 1970), the Mahasarakham Survey (Kijngam et al. 1980) and the Phimai Survey (Welch 1981). The latter includes the previously excavated site at Phimai (Solheim 1965) and some sites recorded outside the formal survey area. Two of the series of small surveys conducted by Solheim and Gorman (1966) are also in the subregion. However, no sites at all were found in the Nam Phung area (Solheim and Gorman 1966: 163-164) and all the Lam Pao sites are historic (Solheim and Gorman 1966:124-163). The negative Nam Phung evidence is interesting because the survey area was in a highland valley with numerous rockshelters. This is another case where Hoabinhian sites were not found in such topography. It is not surprising that Hoabinhian sites were not found in the surveys out on the plains.

The earliest known site in the subregion is Ban Chiang Hian which was initially occupied ca. 1400 - 1000 B.C. (Chantaratiyakarn 1984:68), ie. at the very end of the early village farming period. All other dated sites fall in the iron age village farming period. Several radiocarbon dates have been published for the Roi Et excavations. These dates, combined with ceramic analysis, are divided into three phases by Higham (1977). Phase 1 (ca. 500-0 B.C.) is found only at Non Dua in levels 12 to 17. Phase 2 (ca. A.D.

0-700) includes the distinctive Roi Et ware and is found at all three sites. Phase 3 (ca. A.D. 700-1000) is also found at all three excavations. There is no description of the ceramics from the other Roi Et sites and they remain unsigned. Radiocarbon dates for Phimai area sites have been processed but not published. David Welch (personal communication 1982) indicates that they support the tentative dates for the pottery traditions defined in his preliminary report (Welch 1981). The tentative dates are Tamyae (1000-500 B.C.), Phimai (500 B.C. - A.D. 500), Early Historic (A.D. 500 -1300) and Recent Historic (A.D. 1300 to present). Thamyae tradition pottery is found on three habitation sites (NR-A-10 and 11, and NR-B-01). The Phimai tradition ceramics are present or probably present on all but one (NR-A-24) of the habitation mounds, one of the reservoirs (NR-A-24), and all the sites outside the formal survey area (Welch 1981:Table 1). All the Phimai area sites have historic ceramics as well. The Maharasarakham prehistoric survey sites are generally not dated due to the lack of expected ceramic links with nearby dated sequences, as described above for the Khumphawapi survey area. Six of the sites (nos. 142, 143, 146, 161, 162, and 174) are described as having pottery corresponding to the Roi Et series (Kijngam et al. 1980:94), and one (no. 194) has pottery which appears to the analysts to correspond with the late Middle Period at Non Nok Tha (1000-0 B.C.) (Kijngam et al.

1980:43). These dates generally fit the picture of iron age occupation in the subregion. However, this cross dating appears somewhat dubious given the pattern of dissimilar clusters of ceramic traits across the region.

Once again, sites in each of the survey areas apparently have ceramics which are similar to each other but which are quite different between each area (compare Higham 1977, Welch 1981, and Kijngam et al. 1980:94). This is highlighted by the inability to cross-date the Mahasarakham Survey sites with any confidence.

The settlement pattern is quite clearly associated with rice, although there are little data which directly indicate that rice agriculture was important economically. In the Phimai survey area, sites are spread evenly across land suited for rice cultivation and none were found in highland areas, although the latter areas have not been intensely surveyed (Welch 1981). The Mahasarakham sites were analysed for the same environmental variables as the Kumphawapi sites and, again, the settlement pattern is characterized by location on riceland and near a water course (Kijngam et al. 1980:59-66). The Roi Et excavated sites are also associated with land suitable for rice (Higham 1975a:Figure 4 and Table 1).

Most of these sites are clearly occupation sites although the picture is muddled, in part because many of these sites were occupied into historic times when settlement

patterns appear to shift. Welch (1981:Table 1) lists 15 sites as habitation mounds. This group includes Ban Suai (NR-A-04) which is within the larger historic walled town of Phimai. Most, if not all, of the Maharasarakham prehistoric sites have occupation (Kijngam et al. 1980:39-45). Most are described as mounds or villages, and occupational debris is mentioned or identified. In Roi Et, Bo Phan Khan is primarily a salt-working site but also has occupation levels, and Don Taphan and Non Dua are interpreted as occupation deposits, with specific mention of postholes at Don Taphan (Higham 1977:112).

However, the Khorat Basin excavations which have been minimally reported have only limited evidence of the multiple functions which have been evident in data from excavations elsewhere. The brief report on Ban Chiang Hian (Chantaratiyakarn 1984) does not include a list of recovered artifacts. Iron slag is mentioned for Ban Suai (Solheim 1965), but absence of other evidence at this site may be due to the lack of published data. However, there is apparently a genuine absence for the Roi Et sites; Bo Phan Khan, Don Taphan and Non Dua. Higham (1977:113) states that, except for a Khmer bead, "pottery comprises the entire sample of material culture". This cannot be literally true since he elsewhere mentions iron from Don Taphan (Higham 1972:468) and slag from both Bo Phan Khan and Non Dua (Higham and Parker 1970:9, 17 and 18), but it is clear that other

evidence which might be expected is not present. Rice was found throughout the occupation at all three Roi Et sites, and evidence from Non Dua also indicates domestic cattle and pig from early in the occupation and possible domesticated water buffalo in later levels (Higham 1977:113).

At Ban Chiang Hian (Mahararakham site no. 161) and eight of the Phimai area sites (NR-A-10, 11, 12, 19 and 23, and NR-B-01, 03 and 04) earth works are associated with occupation sites. Many such sites are known across the Khorat Basin as the result of work with aerial photographs (Williams-Hunt 1950) but only these few (and Don Sawan in the outliers subregion) have been the subject of archaeological investigation. The traditional interpretation of these walls and moats is that they were fortifications, but Welch (1981:16-19) reviewed the evidence and does not find it satisfactory. He proposes alternate explanations, including that some, perhaps all, of the earthworks are for water control rather than fortification. These earthworks are considered here to represent different (and as yet unclear) site activities rather than a different type of site.

Phimai was classified as a separate site type by Welch. It is both large (60 ha.) and has major constructions including the Khmer Temple and a surrounding wall. However, it is unclear how much of the area was actually occupied prehistorically. Ban Chiang Hian is much larger (38.7 ha) than the other Mahararakham sites and is interpreted as a

"major center" (Kijngam et al. 1980:66-79). Again, it is not clear how much of this site was occupied prehistorically. The presence of these large sites and earthwork sites make it clear that some changes in settlement pattern were taking place in late prehistoric to early historic times in this subregion.

The Regional Perspective

The surveys and excavations considered above have provided a broad picture of prehistory in the Northeast Thailand region. Hoabinhian sites are conspicuous by their absence over almost all of the region. No Hoabinhian cave sites were found in the highlands surveyed along the western piedmont and the only known open Hoabinhian site is the Mekong Riverbank site excavated by the Pa Mong Survey.

Non Nok Tha and Ban Chiang remain as the earliest known sites on the plateau in spite of considerable archaeological work. Only a few other sites (Ban Tong, Ban Phak Top, Ban Nadi, and Ban Chiang Hian) have been found which pre-date 1000 B.C. On the other hand, numerous sites have been found representing periods post-dating 1000 B.C. These later sites are found in most surveyed areas across the region, with a notable exception in the Loei area of the Pa Mong Survey. Most of the prehistoric open occupation sites across the plateau are found in the vicinity of riceland. However, two sites recorded by the Petchabun Piedmont Survey

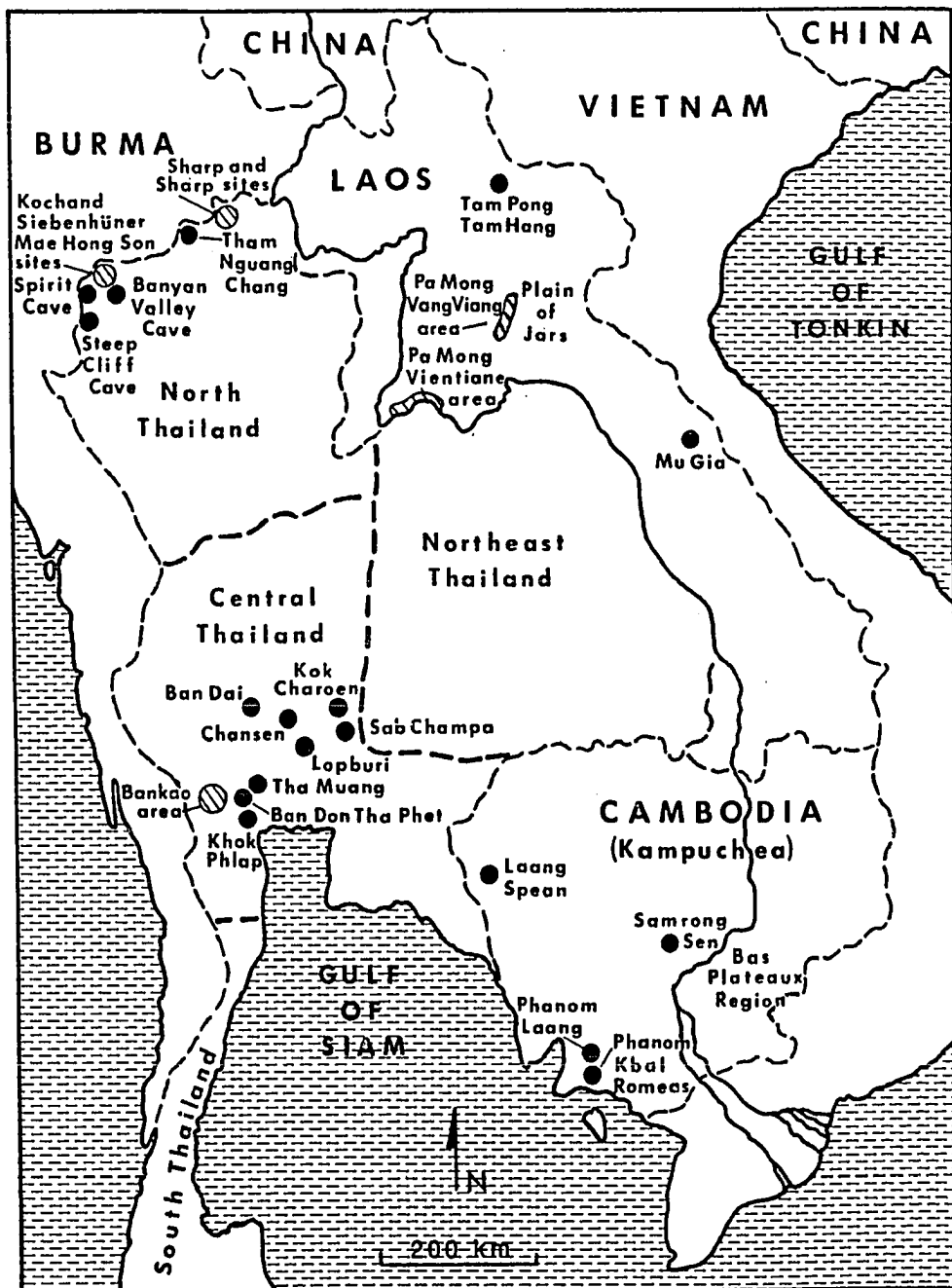
are on highland stream terraces. Ceramics from each of the survey areas across the region appear to be quite distinct and suggest cultural clustering of sites. The Petchabun Piedmont Survey defined, at least partially, one such cluster which is apparently restricted both temporally and geographically.

Surrounding Regions

Following the original research plan, this review of comparative literature would have been completed with the preceding discussion of Northeast Thailand. However, research in this region has one major flaw with regard to the central research problem. This is the total absence of known (unmodified) Hoabinhian sites. Therefore, the discussion is here extended to include the surrounding regions (Figure 6-3) in order to include Hoabinhian sites in the discussion and to assess the apparent uniqueness of Northeast Thailand in this regard.

North Thailand

Spirit Cave (Figure 6-3) was a major site in the development of cultural sequences for Southeast Asian. Data from the site and their implications were discussed in some detail in Chapter 1. To reiterate briefly, the stratigraphic excavation and radiocarbon dating of the site revealed



- Archaeological site
- ⊙ Area with archaeological sites

Figure 6-3. Sites and localities in regions surrounding Northeast Thailand.

Hoabinhian levels dating from ca. 13,000 to 6800 B.C., and modified Hoabinhian levels dating from 6800 B.C. to the latest occupation at 5600 B.C.

Steep Cliff Cave and Banyan Valley Cave (Figure 6-3) are two other Hoabinhian cave sites excavated by Gorman (Higham 1979:673). Occupation of both sites begins after that at Spirit cave (5500 B.C. and 3500 B.C. respectively). Banyan Valley Cave had a tanged stone projectile point, sherds, and polished stone adzes in the deposit. The last occupation at Banyan Valley Cave is apparently as late as A.D. 900 and indicates that the modified Hoabinhian period may have persisted quite long, at least in some areas.

Tham Nguang Chang in the far north (Figure 6-3) presents a different picture (Watson 1968). Lower levels of this site have a Hoabinhian assemblage. However, upper levels have, rather than a modified Hoabinhian assemblage, inhumation burials with iron tools and cordmarked pots (Watson 1968:Plate XLVII). This later utilization resembles burial practices at a number of lowland sites and appears to date to a period when modified Hoabinhian occupation is present elsewhere. There is apparently a significant shift in site utilization here, but since no dates and only a note on the excavation are available, one can only speculate on the possible temporal and cultural relationships.

These cave sites are all in limestone highlands, a geological situation identical to certain parts of the

Petchabun Piedmont and Piedmont Outlier zones of Northeast Thailand. In the northeast, however, no Hoabinhian stone tools have been identified in such caves.

The presence of modifications in the Hoabinhian assemblages at Spirit Cave and Banyan Valley Cave, and the inhumation burials with iron at Tham Nguang Chang, make it seem reasonable to expect lowland sites in North Thailand which would be similar to those from the northeast. However, none have been found.

Koch and Siebenhuner (1969) reported some archaeological data while on geological expeditions at scattered locations across the region. They recorded one cave and seven open scatters of lithic tools and debris. Only a slate scraper and a small sandstone grinding stone were found in the cave, and no connection can be made with the Hoabinhian sites above. Six of the seven lithic scatter sites are on hilltops. Presumably, these locations are some distance from water and riceland. Their location and absence of evidence for occupation indicate that these sites had quite limited use, namely manufacture of stone tools. No pottery was found on any of these sites, but polished stone tools were found on three hilltop sites (locations 1-3) in Mae Hong Son (Figure 6-3). On one of the other sites, a chipped stone tool in the form of a shouldered adze was found. These suggest that at least some of these sites were workshops for

the production of groundstone tools, and therefore, probably contemporary with modified Hoabinhian periods.

Sharp and Sharp (1964) reported on several archaeological sites and other finds encountered while conducting ethnographic survey. In all but one case, the finds are from Chiang Rai Province and adjacent areas of Burma (Figure 6-3). They found polished adzes, polished stone bangles, and sherds in two relatively restricted areas but could not locate an archaeological deposit in either area. These areas each extend about 3 km along the terraces of the Maesalong River and Huai Dua, a small tributary of the Maesalong. Though poorly defined, each area probably represents one or more open occupation sites. Material from these sites includes sherds and groundstone adze/axes which are found in modified Hoabinhian deposits, and these sites have assemblages suggestive of the expected open lowland sites. However, these sites are along terraces of highland streams rather than oriented to ricelands. Prehistoric sites in riceland remain unknown in the north. It can be noted that two of the sites from the Petchabun Piedmont Survey, including the excavated site Non Khaw Wong, are on similar highland stream terraces. The other sites and finds reported by the Sharps were historic.

Central Thailand

Hoabinhian cave sites are not present across the central plain but are known from the mountains to the west. The cave sites which have been reported are all from the Ban Kao area (Figure 6-3) in the vicinity of the village of Ban Kao on the lower Kwae Noi River in Kanchanaburi Province. Heider (1960) reported two caves near Ban Kao; Tham Phra (Kan 1) and Tham Taroo (Kan 4). The Thai-Danish expedition in the early 1960's located several caves and excavated in at least five (Heekeren and Knuth 1967:19-20). An extensive rock painting site was also located and recorded. Excavation in the small cave, big cave, and terrace locations at Sai Yok have been reported in a monograph (Heekeren and Knuth 1967). Some selected data are available for Ongbah Cave (Sorensen 1973 and 1979) but the other caves (two Chande caves, Lawa Cave, Khao-Ma Cave, and Tham Roop) are only mentioned in passing. More recently, Pookajorn (1981) has reported on Thai excavations at four caves in the Ban Kao area; Heap, Khao Talu, Ment, and Petch Kuha caves.

Deposits with flaked stone tools but no ceramics or groundstone tools (ie. unmodified Hoabinhian) have been radiocarbon dated between 9230 and 7400 B.C. at Ongbah Cave (Sorensen 1979:79) and between 8030 and 5580 B.C. at Khao Talu Cave (Pookajorn 1981:50). Deposits with both flaked stone tools and ceramics (ie. modified Hoabinhian) at Khao Talu Cave have yielded radiocarbon dates of 2265 B.C. and

1470 B.C. (Pookajorn 1981:50). These data clearly support the Hoabinhian/modified Hoabinhian sequence proposed by Gorman (1971). Ongbah Cave and the big cave at Sai Yok have burials in the deposit, and Khao Talu Cave has disturbed evidence of burials. Dating of these burials is unclear. Two radiocarbon dates ca. 2000 B.C. were obtained from Ongbah Cave but were rejected because the lower Level 5 date was younger than the higher Level 2 date (Sorensen 1973: 141). Sorensen estimates dates of 1300 to 1100 B.C. based on ceramic resemblances to nearby sites (Sorensen 1979:79). Iron is associated with some of these burials and suggests still later dates. Carved wood "boat" coffins were found in Ongbah Cave and a wood sample from one of them was dated to 230 B.C. Such coffins are known to exist in many caves in Southeast Asia but systematic investigation has not been done. It is as yet unclear if these simple and coffin burials represent a later phase, which seems to be assumed by Sorensen and Pookajorn, or only a shift in site utilization which is suggested by late dates for modified Hoabinhian occupation elsewhere (Higham 1979). Historic jar burials are also present at Sai Yok. All these cave sites are in limestone highlands. Hoabinhian sites are found in similar circumstances in North Thailand but not in Northeast Thailand.

A number of open sites have also been reported in the Ban Kao area (Heider 1960; Sorensen and Hatting 1967:8-9).

Several of these are open lithic scatters; Kan 2, 3, 9 and 11, and BK III, IV, V, VI, VII and VIII. These sites have not been excavated or described in detail. The stone tools are not designated as Hoabinhian, although some are described as monofacial pebble tools, a description which fits some characteristic Hoabinhian tools. The age and nature of these sites is very unclear. Seven other sites (BK I, II, IX, X, XI, XII and XIII) have deposits of ceramics and other artifacts. Extensive excavation were conducted on the Bang Site (BK I), and smaller excavations on Lue Site I (BK IX) and Lue Site II (BK X). Detailed reports have been published on burials from the Bang Site and Lue Site II (Sorensen and Hatting 1967; Sangwichien 1969) but the large majority of the artifactual material from the excavations is occupational debris which has only been briefly described (Sorensen and Hatting 1967:11-15). Dating of the Bang Site has been controversial, partly because of the excavation methods. Eight radiocarbon dates ranging from ca. 1800 to 1300 B.C. have been reported for the Bang Site, and a date of 2420 B.C. has been reported for a Lue Site (I or II?) (Smith and Watson 1979:Appendix I). The main point of controversy is whether the dates are associated with the burials, as Sorensen assumes, or whether the dates refer to the deposit into which the burials were excavated (Parker 1968; Solheim 1969a; Bayard and Parker 1978). The latter interpretation seems more reasonable to this author, but the

question cannot be resolved with the data available. Ceramics from the excavations at Lue Site I and Lue Site II, and from surface collections at Lue Site III (BK XI) and Lue Site IV (BK XII) suggest that they are culturally related and probably contemporary with the Bang Site. However, the Pottery Site (BK II) and the Landing Site (BK XIII) have quite different ceramics from the Bang Site and cannot be placed temporally or culturally (Sorensen and Hatting 1967:9). The Ban Kao area sites are located in a river valley between limestone mountains. Detailed description of the site environments are not available. A number of the sites appear to be located on river terrace formations and, in general, these sites do not appear to be associated with riceland -- at least not extensive tracts of riceland.

Across the broad central plain of Thailand -- riceland almost by definition -- several sites have been reported. None yielded dates as early as those from Ban Kao. Chansen has been reported in detail (Bronson 1976). The earliest occupation at Chansen (Phase I: 600? - 400? B.C. and Phase Ib: ca. 200 B.C.) is "pre-Indian" (ie. inhumation burials are present) and iron is present. Phase II (A.D. 50? - 250) has early evidence of contact with India. Phases III to VI date to A.D. 250 - 1100. Bronson (1976:12-13) attempts, with limited success, to correlate these phases with the Funan, Dvaravati and early Lopburi historic periods. In

these later periods, the site grew in size, earthworks were constructed, and evidence of contacts with India is present.

There are several other sites across Central Thailand which have iron and inhumation burials indicating rough contemporaneity with early Chansen. These include Ban Dai (see Bronson and Han 1972), Ban Don Tha Phet (Glover 1980; Rajpitak and Seeley 1979), Khok Phlap (Daeng-Iet 1978), Lopburi (see Bronson and Han 1972), and Sab Champa and a second unnamed site 3 km south of Sab Champa (Maleipan 1979). Five carbon-14 dates between 210 B.C. and A.D. 160 have been obtained from excavations at Tha Muang within the historic city of U Thong (Loofs 1979:346-348; see also Watson 1968 and Loofs 1970). These dates suggest early occupation of this historic city (abandoned A.D. 1350) but lack of published stratigraphic or artifactual data prevent further analysis. Kok Charoen (Watson 1968 and 1979; Loofs 1970; Loofs and Watson 1970) has occupation and burials, but a single piece of bronze wire was the only piece of metal recovered. Some TL dates suggest occupation about 1000 B.C. It may thus be a candidate for another pre-iron occupation in Central Thailand. Interestingly, Kok Charoen is located in riceland near limestone hills on the far eastern side of the central plain. It is, thus, in a similar geographical position to the Petchabun Piedmont Survey on the opposite side of the Petchabun Mountains and to Ban Kao on the opposite (west) side of the central plain.

All of the open sites discussed above have inhumation burials and most have evidence of occupation (deposits of debris, and in some cases postholes). However, the picture of occupation on these sites is somewhat muddled. Bronson and Han (1972) refer to Lopburi and Ban Dai as "cemeteries", and the brief reports on Khok Phlap (Daeng-Iet 1978) and Ban Don Tha Phet (Glover 1980) make them appear to be mainly burial sites. However, none of these reports makes clear whether these sites are ones with only burials, or merely ones with many burials. In other words, these four sites may also have been occupied. Evidence for metal working is found in the form of iron slag at the Bang site (Sorensen 1973:151), Chansen (Bronson 1976:29) and Tha Muang (Loofs 1979:346), and in the form of crucibles at Tha Muang (Loofs 1970:181), and in the form of casting moulds at the unnamed site near Sab Champa (Maleipan 1979:340). Spindle whorls have been found at Chansen (Bronson 1976:24) and at Ban Don Tha Phet (Glover 1980:21).

Cambodia and Laos

Far less data is available for Cambodia and Laos, the remaining regions surrounding Northeast Thailand.

Laang Spean is the best known cave site in Cambodia (Mourer and Mourer 1970, Mourer et al. 1970). The stratified deposit has an unmodified Hoabinhian assemblage in the lowest levels and Hoabinhian tools with pottery in the upper

levels. The pottery-containing levels yielded carbon-14 dates ranging from 4290 B.C. to A.D. 750. This corresponds to the modified Hoabinhian dating from North Thailand, except that the early date is later than the beginning date for modified Hoabinhian from Spirit Cave. The rock shelter site at Phnom Kbal Romeas and one of the caves at Phnom Laang have given carbon-14 dates in the modified Hoabinhian period (3420 B.C. and 2420 B.C. respectively) but are not described in detail (Carbonnel and Delibrias 1968). A few cave sites are known from Laos but very little information is available for them. Hoabinhian sites at Tam Pong and Tam Hang in Luang Prabang were excavated with little control (see Bellwood 1979:69-70). The excavation at Mu-Gia in Nhom-malat (Saurin 1952) yielded a modified Hoabinhian assemblage including a polished stone adze and pottery. Two cave sites were tested by the Pa Mong Project in the Vientiane area on the Laotian side of the Mekong River (Bayard 1980b:91-97). Tham Pha Hom Phao (V 8) is probably not even prehistoric but Tham Din (V 9) had Hoabinhian stone tools and pottery from the earliest levels. Four cave sites were also located in Vang Viang by the Pa Mong Project but are only described briefly (Bayard 1980b:61-62).

It is known that open sites are quite common in Cambodia but very little data is available. The large mound site of Samrong Sen has been known archaeologically for a long time (Mansuy 1902). A carbon-14 date of 1280 B.C. was

obtained from shell found at between 1 and 1.5 m deep in the deposit (Carbonnel and Delibrias 1968). Many other open sites have also been found in the "Bas Plateaux" region of Cambodia including circular earthworks and habitation mounds (Carbonnel 1979:224-225). Carbon-14 dates of 2130 ± 100 B.P. and 1130 ± 100 B.P. were obtained from the organic temper in sherds collected from the surface of two of the habitation mound sites. Groslier (1966:195) excavated one of the earthwork sites at Mimot and briefly characterizes it as "Neolithic." Along the Mekong in Laos, the Pa Mong Project found mainly historic open sites (V 1-7 and V 10-11) (Bayard 1980b:56-61). However, four of these sites (V1, 3, 4 and 7) have Tak Det Buff ware pottery which seems to be late prehistoric to historic. If these sites do indeed have earlier, prehistoric components, they mark a cluster of sites separated by a considerable distance from the Phu Kradung ceramic sites (see the discussion of the Petchabun Piedmont subregion, above). One of the three Vang Viang area sites (VV1) is a small mound with numerous modern sherds but it may have a prehistoric workshop present, represented by a stone adze and numerous chipped pebbles. Also of interest are the megalith and tomb sites in northeastern Laos, and the stone jars of the "Plain of Jars" in northcentral Laos. These sites were described by Colani in the 1930's (see Bellwood 1979:194-198). The archae-

ological evidence is slight but it appears that at least some of these northern Laotian sites are prehistoric.

Summary and Discussion

Hoabinhian cave/rockshelter sites are present in highlands in all regions adjacent to Northeast Thailand. They are also present in highlands of Burma (eg. Padah-lin; Thaw 1971), Malaysia (eg. Gua Cha; Sieveking 1954, and Gua Kechil; Dunn 1964), Vietnam (Tan 1978), and South China (Chang 1977:76-79). However, the highlands surveyed along the Petchabun Mountain piedmont by the Petchabun Piedmont Survey, the Pa Mong Survey, and the Lam Phra Plerng Survey produced no Hoabinhian sites. Hoabinhian sites could be absent in other highland areas, but systematic survey data to demonstrate this is not available. On present evidence, the Petchabun Mountains are an exceptional area with regard to the distribution of highland Hoabinhian sites. No explanation can be given for this. Hoabinhian sites have not been found over the plains of Southeast Asia, and Northeast Thailand is no exception in this regard. The Pa Mong Survey did find and excavate a unique open Hoabinhian site along the bank of the Mekong River in Northeast Thailand. The only other open Hoabinhian sites presently known are the shell-mound sites along the coasts of Malaysia and Vietnam (see Gorman 1971:306).

The adjacent regions, however, have not produced evidence of open occupation sites as early as Non Nok Tha and Ban Chiang. Ban Kao, along the mountains of west-central Thailand, and a few sites in Northeast Thailand are candidates for other early village farming sites. The central plain of Thailand apparently was not occupied until the iron age village farming period. No riceland-oriented sites are known from North Thailand, although some undated open sites in highland settings have been reported by non-archaeologists. Open occupation sites are quite numerous in Cambodia, and some are known in Laos, but very little data is available. Developments in Vietnam and South China appear to be generally similar but with some distinctive differences (Davidson 1975; Chang 1977; Meacham 1977). Analysis of the Vietnamese and Chinese data would be a major undertaking which is not attempted here.

Finally, with specific regard to the central theoretical problem, it can be stated that there are no known sites representing the hypothetical agricultural transition which was posited in the models (Figure 1-2) which were followed in developing this research project.

CHAPTER SEVEN

RESULTS AND CONCLUSIONS

Research Results

Results of the Petchabun Piedmont Survey indicate a cultural sequence quite different from that predicted by a study of models relevant to the central theoretical problem (see Chapter 1). The absence of expected sites has generated a critique of the cultural sequences which predicted them and a consideration of alternative models. This topic is the subject of the first section below. The presence of a cluster of iron age village farming sites in the Petchabun Piedmont focused attention on sites of similar age across Northeast Thailand and adjacent regions. Evaluation of the piedmont sites and a review of the literature resulted in the definition of the Southeast Asian Iron Age which is presented in the second section below.

The Absence of Expected Sites

In terms of theory, the principle result of this survey is the evident absence of certain expected sites. Hoabinhian sites (ca. 12,000-7000 BC), transitional Hoabinhian to

village farming sites (ca. 7000-4000 BC), and early village farming sites (ca. 4000-1000 B.C.) were expected in the piedmont subregion (see Chapter 1). None were found. No Hoabinhian stone tools were found. The Phu Kradung ceramic sites which were found pertain to the first half of the iron age village farming period (ca. 900 - 0 B.C.). Other work along the Petchabun Piedmont (the Lam Phra Plerng Survey and portions of the Pa Mong Survey) indicated that the expected sites are not present anywhere in the subregion.

Alternative Explanations

A series of logical alternatives, some of which are frankly speculative, are considered here as possible explanations of the absence of transitional sites.

The absence of the expected sites in the sample recorded by this survey may be explained in three ways:

1. True absence. There were no people living in the survey area prior to ca. 900 BC.
2. No sites. There were people living in the survey area but they left undetectable archaeological remains.
3. Sites not located. The expected sites were present but were not located in the piedmont survey.

Each of these explanations remains a possibility, however remote, and will be discussed here, then incorporated in the following reevaluation of cultural sequences.

True absence is the obvious, prima facie, answer and has been the answer generally used in developing the models discussed below. Arguing from available data is, of course, reasonable. The absence of Hoabinhian sites on the plains of the piedmont survey area, and across Northeast Thailand, adds to the general Southeast Asian pattern. Hoabinhian sites are only presently known in karst uplands, and coastal and riverine environments. However, the absence of Hoabinhian sites in any of the highlands of the Petchabun Piedmont appears to be a more specific pattern. Hoabinhian sites were not found in the limestone caves of this subregion as they have been in similar areas over much of Southeast Asia. Hoabinhian sites may be absent in some similar areas elsewhere but systematic survey data to demonstrate this is not available (with the minor exception of the Nam Phung Survey). One reason for the prediction of the presence of transitional sites in piedmont areas was the negative evidence, assumed to represent true absence, for transitional sites elsewhere in mountain or plains zones. If transitional sites are truly absent in the piedmont as well, this would have serious effects on the cultural sequences which formed the basis of this research. However, it is rather difficult to believe that no one at all was in the survey area before 900 B.C. The general absence of Hoabinhian sites on the plains of Southeast Asia was considered to be possibly an illusion by Gorman (1971:306), since subtropical plains

environments are considered optimal for hunter/gatherers. The mountains of the research area appear to be similar to other mountains and there do not appear to be any inherent reasons why broad-spectrum hunter-gatherers, such as the Hoabinhian people, would not have used this area. We also know that people lived at Non Nok Tha, only approximately 50 km east of the survey area, in the early village farming period. These arguments raise the possibility that the area was occupied prior to 1000 B.C., but that the occupation was not detected.

The second possible explanation, absence of sites, may appear to be improbable but has a basis in ethnographic data. The Phi Tong Luang are gatherer/hunters who live in the mountains of North Thailand (Siedenfaden 1926; Weaver 1956; Bernatzik and Bernatzik 1958; Nimmanahaeminda and Hartland-Swann 1962; Boeles 1963; Young 1974:69-73), and who formerly lived in the Petchabun Mountains (Siedenfaden 1919; Kerr 1924). According to these ethnographic reports these people used no stone tools and made no pottery. Their material culture was almost entirely made of perishable materials such as bamboo, wood, and leaves. Ethnographic data on the Phi Tong Luang is slim and there are problems in using them as models for prehistoric hunter/gatherers (see Hutterer 1976), but they open an important possibility which must be considered carefully. What is termed here the "Phi Tong Luang model" suggests that hunter/gatherer occupation

could be completely or nearly invisible archaeologically. The presence of perishable tools, particularly bamboo, in the Hoabinhian assemblage has been considered (eg. Gorman 1971:312). However, Hoabinhian sites are recognized in survey by the presence of the stone tools. Perishable materials are recognized only in careful excavation or inferred from laboratory analysis, eg. edge wear analysis. Sherds and groundstone tools are additions to the later, modified Hoabinhian assemblage. Southeast Asia, particularly the plains, appears to be lacking in quantities of stone suitable for manufacture of flaked stone tools and it is not difficult to imagine areas where stone was not used, or carefully hoarded. If stone tools were absent or rare, it is quite possible that "Hoabinhian" sites would be virtually invisible in survey and "modified Hoabinhian" sites would yield only a few pieces of pottery. It is possible that some of the cave and smaller occupation sites recorded by this survey may be the unrecognized remains of such sites.

The last possibility considered here is that the expected sites existed but simply were not found by this survey. This appears to be a rather remote possibility with regard to the expected Hoabinhian cave sites. Sixteen cave sites were recorded and numerous other caves were investigated. No Hoabinhian stone tools were found. It is interesting to note in this connection that the people

interviewed in this survey and who served as guides were lowland rice farmers. No hill tribes presently live in the mountains of the survey area. The lowland villagers hunt mainly as a leisure time activity. They do not venture far from their villages and rarely stay out overnight. Therefore, their knowledge of the remoter mountain zones of the survey area is rather strictly limited. In some cases, the survey team walked several hours into the mountains to visit a cave but we rarely even met someone with knowledge of more remote caves. In no case did we encounter the combination of a likely site and a reliable guide which would have been necessary to commit the survey team for a long trek into the mountains to investigate a remote site. A Hoabinhian site could well exist undetected in the remoter mountains of the survey area.

The absence of the expected transitional sites could be a problem of site detection. Assemblages somewhat like modified Hoabinhian were predicted in piedmont areas. The expected transition was believed to have involved utilizing rice (and taro according to Gorman) in these piedmont zones as well as the vertically stratified resources of the mountains. Thus, the sites probably were small and shifting (at least shifting more frequently than established rice-farming villages). The remains of such sites would be both smaller in area and less dense in artifacts than the sites found in this survey. There is a real question whether such

small sites could be located with present survey methods. Present knowledge of prehistoric occupation sites in Southeast Asia is rather strictly limited to two types of readily located "central places"; the cave/rock shelter sites, and the relatively large and dense (and often readily visible mound) village farming sites. Both these site types are readily recognizable when described to villagers who are the primary source of archaeological site location information under current survey practices. Of course, caves and mounds may in fact be the main types of prehistoric sites, but the possibility of smaller or more dispersed sites should not be overlooked.

Another possible way that these hypothetical sites could exist and not be located is that they could focus on locations where they would be extremely difficult to detect, such as areas now buried under alluvium.

It appears possible, at least theoretically, that there may be a whole class of difficult-to-detect sites which have not yet entered the archaeological picture in Southeast Asia. However, the sheer weight of evidence appears to argue against this view. This work is largely concerned with the sites which have been reported in European language journals, but the Fine Arts Department of Thailand has also conducted numerous surveys and excavations which are available to those who read Thai. Some of these hypothetical sites should have survived and been detected.

The foregoing are "mechanistic" arguments which deal with where sites are located, what they look like, and how they can be found. There is, however, a theoretical point which should be discussed in this context. Gorman (1977) (the only one who directly addressed the hypothetical transition) clearly believes that there was a gradual shift between Hoabinhian and village farming sites which could be detected in the form of transitional sites in transitional environments. However, this is only one form that change can take. Adams (1966:17-18) adopted the terminology of Braidwood and Willey (1962:351) to describe the polar extremes of change as a "ramp" in which change occurs steadily over time and as a "step" in which change occurs rapidly within a short time. The theoretical alternative to the model followed in the Petchabun Piedmont Survey, then, is that village agriculture arose abruptly with little archaeologically visible transition.

These alternatives are next applied to a critique of the cultural sequences which formed the theoretical basis of the Petchabun Piedmont Survey.

Reevaluation of Cultural Sequences

It is possible that the expected sites were present in the survey area but not detected. As discussed in the previous section, it is possible that the transitional sites are very difficult, or perhaps impossible, to detect (the

"Phi Tong Luang model"), or that these sites are of a sort which are not found under current survey practice. Accordingly, it is actually premature to reject the cultural sequences (see Figure 1-3) which predicted them and these sequences should be retained as one set of alternatives.

Each of the cultural sequences which were used are based on a single basic concept -- that the development of early village farming resulted from a movement of people from the mountains out onto the plains. To recapitulate briefly, Solheim's sequence was an early statement based on tentative data. His Extensionistic Period explicitly postulates movement from the mountains, first into the piedmont, then extending out onto the plains. Higham's sequence postulated movement from mountains (eg. Spirit Cave), to the piedmont (eg. Non Nok Tha), then to the plains (eg. Roi Et). The corresponding economic sequence is from hunter/gatherer/plant-tenders to lowland rice farming then to wet rice agriculture. Gorman postulated movement from mountain hunting-gathering (eg. Spirit Cave), to a hypothetical piedmont domestication of palustrian species, then to plains settlement (eg. Non Nok Tha and Ban Chiang). Dryer central plains areas (eg. Roi Et) were not settled until the later development of irrigation rice agriculture. The position of Non Nok Tha in these sequences perhaps requires further comment. Physically, Non Nok Tha can be considered a piedmont site in that it has access to mountain

environments. The mountain, Phu Wiang, is an isolated monadnock, and Non Nok Tha is included in the Piedmont Outlier zone in this report. Gorman argues that initial domestication took place in specific piedmont environments, namely palustrian habitats where intermountain streams flow out onto the plains (ie. in the piedmont as defined here). Moreover, Non Nok Tha apparently has an economy and technology like Ban Chiang and other early plains sites. Thus, Gorman considers Non Nok Tha to be an established plains site, albeit in a piedmont-like environment.

The Petchabun Piedmont Survey was specifically designed to find hypothetical piedmont transition sites to fill the temporal and geographical gap between the unmodified Hoabinhian sites and early village farming sites. However, neither this survey nor any other recent archaeological work have provided data to demonstrate this hypothetical movement.

It is possible that such postulated movement occurred but not in the survey area; that this survey was simply unlucky in its selection of a research area. The Petchabun Mountains appear to be an exceptional area with regard to the absence of Hoabinhian sites. The review of literature in the previous chapter showed that Hoabinhian sites are found in all regions surrounding Northeast Thailand. However, these regions do not appear to contain the hypothetical transition either, although there is a general lack

of systematic surveys which would make this precisely clear. In the Ban Kao area of west-central Thailand, modified Hoabinhian sites are in close proximity to village farming sites and have similar ceramics (Pookajorn 1981). However, even here the related ceramics are quite late relative to the hypothetical transition. In general, there appears to be no evidence for a transition in the form of movement from mountains out onto plains anywhere in Northeast Thailand or surrounding regions.

Logically, it remains possible that a movement type of transition could have taken place within Southeast Asia, but outside the above reviewed area of Northeast Thailand and adjacent regions (ie. in Burma, Malaya, South Thailand, Vietnam, or South China). The resultant plains agriculture then could have spread by migration or diffusion to other areas of Southeast Asia. One assumption made by Solheim, Higham, and Gorman was that their data from North and Northeast Thailand represented a general Southeast Asian phenomena. This assumption could be incorrect. The concept of a "transition and diffusion" model is left here as a logical possibility since this research was designed as a test of the Solheim, Higham, and Gorman models with data from Northeast Thailand and adjacent regions.

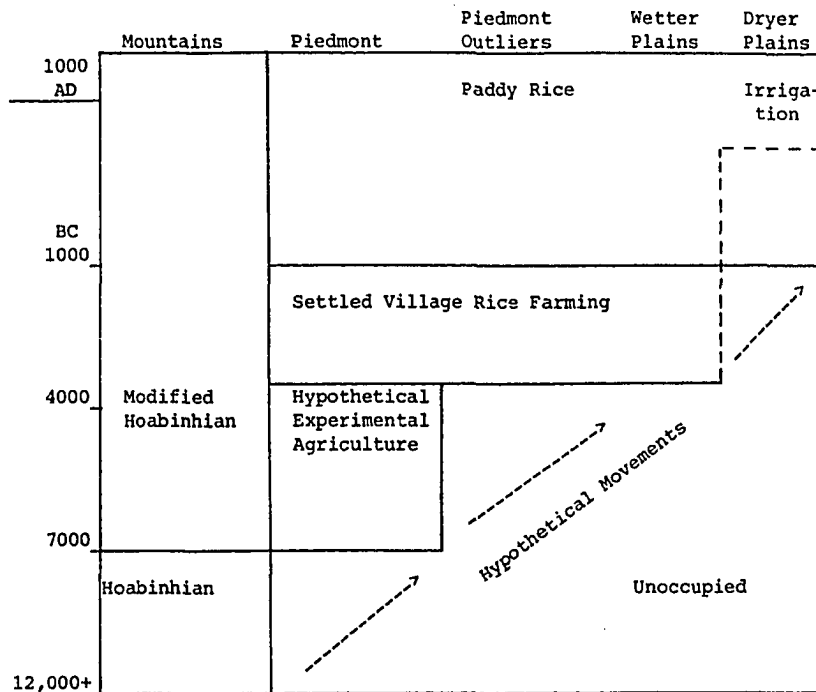
Finally, then, is the possibility that the postulated mountain to plains movement simply did not occur. One alternative in this case would be to abandon the

authochthonous sequences, and return to the old idea that plains agriculture was introduced from outside Southeast Asia and was not developed within the area from a Hoabinhian base. This may be a logical possibility but does not appear to be a viable alternative given that: 1) the domesticated plants and animals (with the exception of the dog) are indigenous to Southeast Asia, and 2) sequences of sites which demonstrate movement of plains agriculture into Southeast Asia have not been found.

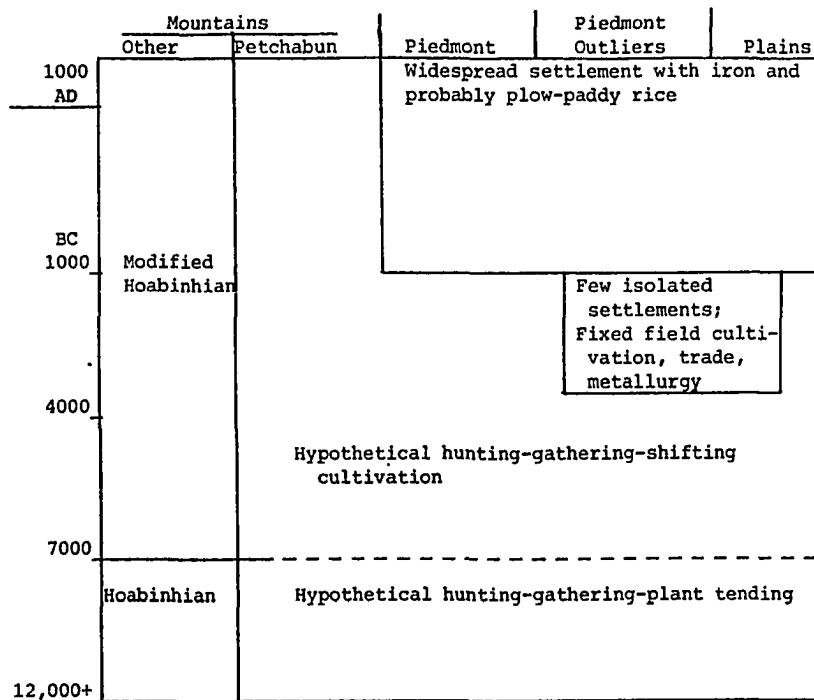
Another possibility in this case is that the agricultural transition could have taken place within Southeast Asia but not in the form of a movement from mountains to plains. An alternative model which addresses this point is discussed in the following section.

An Alternative Model

In answer to the absence of evidence for a movement type of transition, a useful line of approach would be to retain basic data from the cultural sequences and propose an alternative model not based on a movement concept. Figure 7-1 presents a schematic diagram of an alternative model (Figure 7-1B) along with a simplified version of the Solheim/Higham/Gorman model (Figure 7-1A). The alternative model essentially considers that village settlement arose from an in situ milieu of hunters-gatherers and early agriculturists. Village settlement initially took place in



A. Schematic Solheim-Higham-Gorman model.



B. Schematic alternative model.

Figure 7-1. General models.

a few isolated areas on the plains, and subsequently settlement increased in density. Figure 7-2 presents a more detailed version of the alternative model specifically for Northeast Thailand.

The first two "stages" in the alternative model remain hypothetical. This model requires an assumption of the idea, developed above, that sites representing these developments may be missing from the present archaeological record. The "Phi Tong Luang model" suggests that such sites may be difficult or impossible to detect. The sites may also be too small or too inaccessible to be located under present "central place" oriented survey methods.

Even though no representative sites have been found, there does not appear to be any inherent reason to assume that the plains were uninhabited prior to the development of rice agriculture. Indeed, there are a number of reasons that can be given to support early stages of plains occupation. First, the view that Hoabinhian sites are mountain-oriented is an oversimplification. It is true only in terms of number of known sites. Shell mound sites, apparently of similar cultural orientation, are also known (see Gorman 1971:306), as is a Hoabinhian stone workshop site on the bank of the Mekong River (Bayard 1980b:83-86). Logically, then, if Hoabinhian sites are present in mountainous zones, and coastal and riverine environments, they might be expected in the intervening areas. Butzer

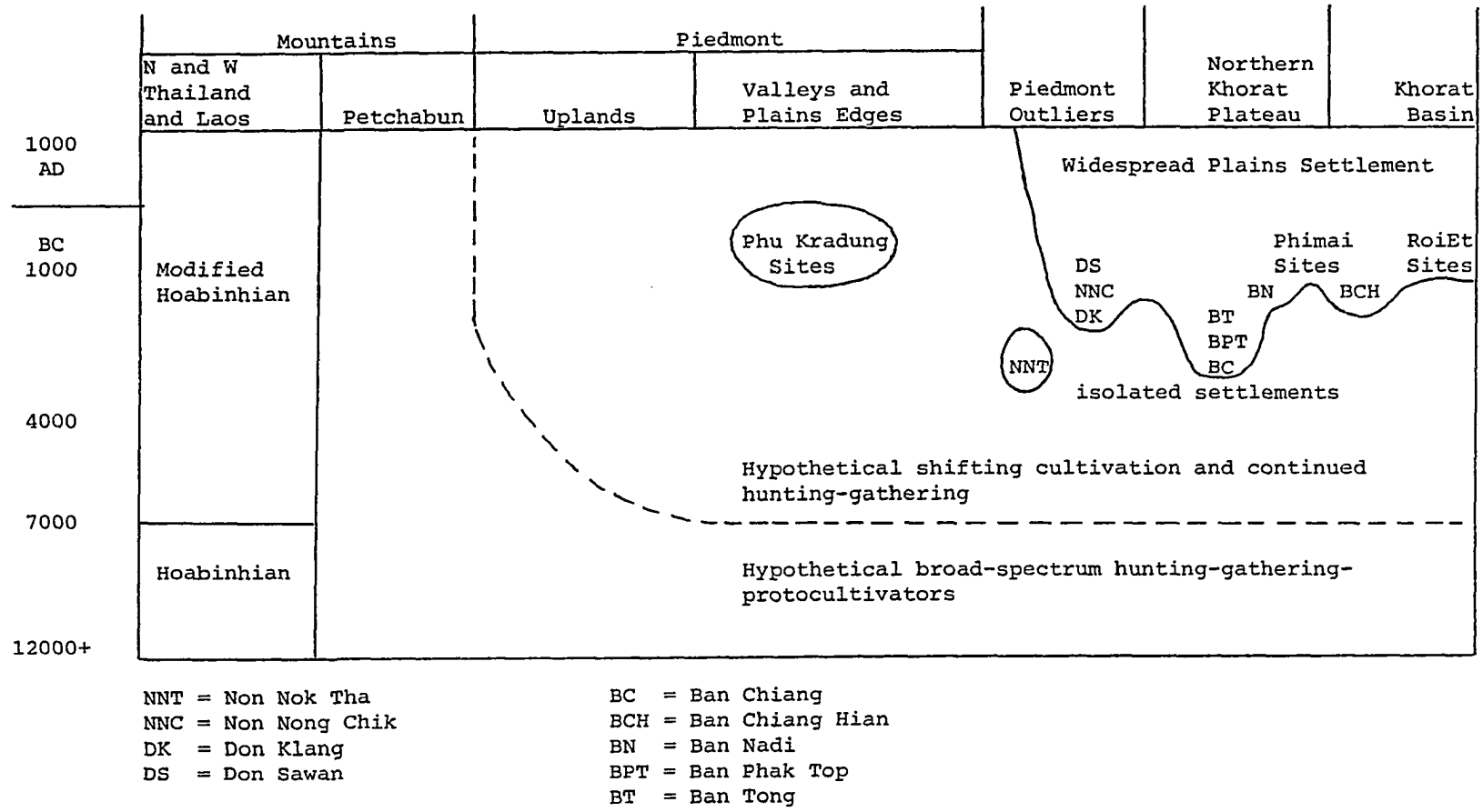


Figure 7-2. Alternative model for Northeast Thailand.

(1971:149-151) believes that the subtropical plains environment is ideal for hunter-gatherers. This was pointed out by Gorman (1971:306), who considered the possibility that the apparent distribution of Hoabinhian sites was an illusion.

Second, the modified Hoabinhian assemblages include pottery, ground stone axes, and small slate knives. These items are also found on village farming sites and suggest that the Hoabinhians were in contact with lowland rice agriculturists in the period after 7000 B.C. (Gorman 1971:313-315). Third, the earliest known village sites on the plains evidence a well developed economic complex including domestic animals and rice agriculture. White (1984) describes early plains settlers as people who already had a sophisticated adaptation to plains resources. The notion of "protocultivation" (Harris 1973) was initially thought to apply to the Hoabinhian sites, but appears to be equally applicable to hypothetical early plains groups. Determination of the antecedents of early Southeast Asian crops is critical to eventual elucidation of the geography of early plant manipulation.

Inherent in the models with which this research has dealt is a "stage" concept of development. Particularly, that plains occupation awaited the development of a stable agricultural system. It appears more reasonable, at least as an alternative, to assume that early inhabitants had knowledge of a broad range of adaptative strategies, and

that agricultural development resulted from shifts in emphases among the possibilities (Figure 7-3; and see White 1984). White (1984) has suggested that early rice agriculture used inundation in permanent fixed fields. This would, in turn, suggest a shift in settlement pattern toward long-term or permanent settlements. Such settlements would be much more visible archaeologically than sites of hypothetical earlier shifting systems. It will be recognized that this is a "step" model of agricultural development in which early village farming sites arose abruptly with a shift to fixed-field agriculture and long-term settlement. It is possible, then, that the obvious shift in presently known settlement pattern may have resulted from a relatively subtle in situ shift in the subsistence base which had dramatic results.

The Southeast Asian Iron Age

The results of the Petchabun Piedmont Survey prompted an interest in sites of equivalent age across Northeast Thailand and surrounding regions. These sites and their implications are discussed here.

Definition

The data recovered in the piedmont survey is a substantial contribution to studies of the late prehistoric "Iron Age" in Southeast Asia. This Iron Age is emerging as

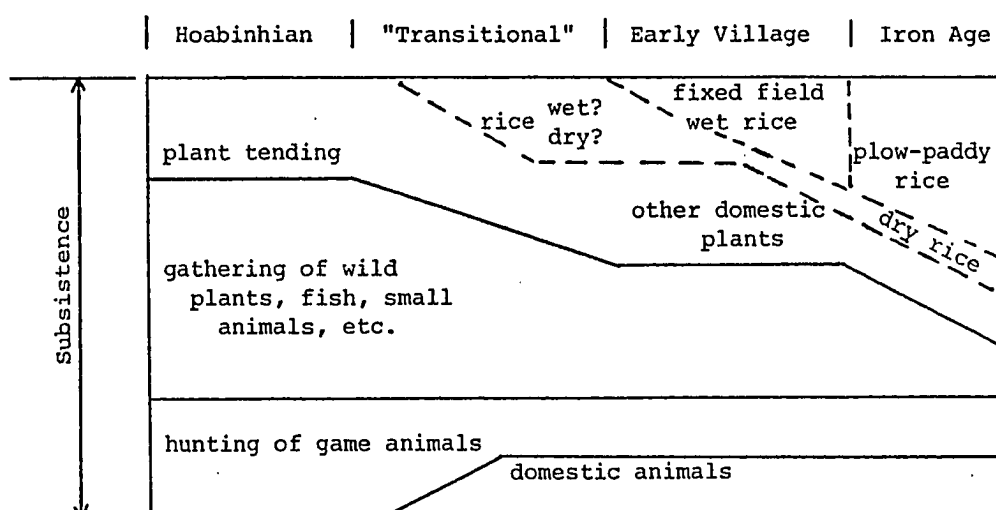


Figure 7-3. Schematic model of shifts in subsistence base.

an important and relatively clearly defined period in Southeast Asian prehistory. Iron is not considered here as a "type fossil", but in reference to a chronological period after its appearance in the Southeast Asian archaeological record. Iron is, of course, a visible and useful characteristic of the period when considered with other prehistoric artifacts. It should be pointed out that designation of this period does not signal an attempt to interpret Southeast Asian data in a technological/ chronological framework developed in other areas. On the contrary, it will be shown that iron plays an important role in unique Southeast Asian developments.

The Iron Age is considered here as a chronological period from ca. 1000 B.C. to ca. A.D. 1000. The beginning of the period cannot be precisely dated but there is evidence that iron was present on the Khorat Plateau at or near the beginning of the first millennium B.C. The Middle Period at Ban Chiang (White 1982a) has assigned dates ca. 1000-300 B.C. and has iron artifacts. White includes the bimetallic (iron and bronze) objects in this middle period. These objects were considered by Gorman and Charoenwongsa (1976) to represent an earlier phase of metallurgy. They tentatively dated these objects to a period 1600-1200 B.C., based on indirect evidence. The earlier dates do not appear to be supported by evidence reviewed by White. The advent of iron by ca. 1000 B.C. has, however, received support from

the 900 B.C. date from an Iron Age burial at Ban Puan Phu, excavated by this survey. There is a divergence of opinion regarding early iron (and bronze) dates (see Higham 1981) which is partly due to the stratigraphic insecurity of some dates. There are, however, a number of early dates which make it seem reasonable to accept the presence of iron in the period 1000 - 500 B.C., and probably close to 1000 B.C. By 500 B.C., iron was demonstrably an established and widespread part of Southeast Asian technology. There are now a rather substantial number of first millennium B.C. sites with iron presently known across northeast and central Thailand. Early iron in Vietnam (Davidson 1975:89) is associated with the Dong-So'n epoch (500 - 250 B.C.) and in southern China (Chang 1977:422) with the Eastern Chou (750 - 220 B.C.). The first millennium B.C., probably from near its inception, witnessed the advent of iron production and its subsequent establishment as a widespread and important aspect of Southeast Asian prehistoric technology.

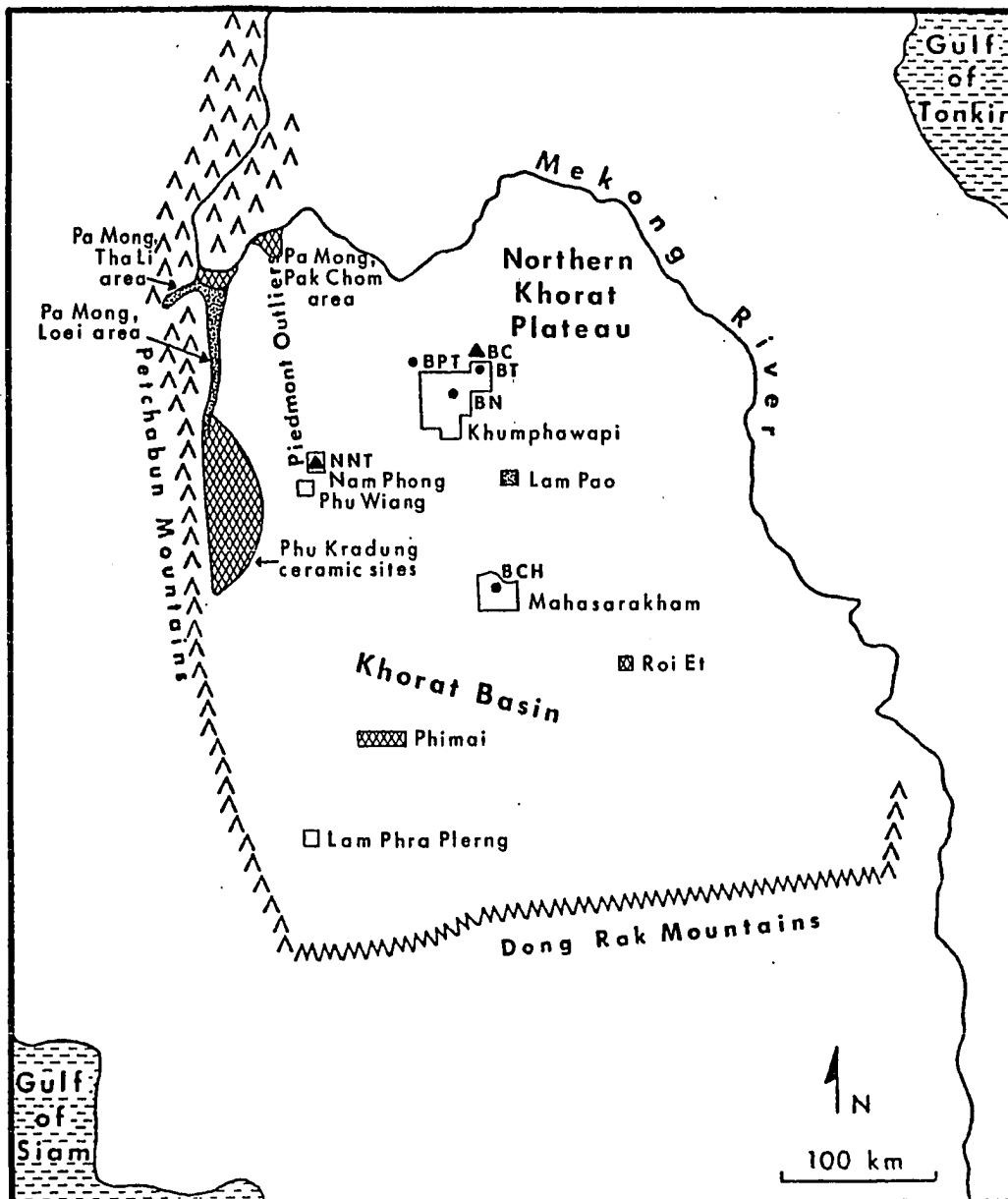
The A.D. 1000 ending date for the period is somewhat arbitrary. The major developments of the Iron Age (iron itself, domestic water buffalo, and plow-paddy rice agriculture) continue up to the present as basic components of village life in Southeast Asia. The expansion of the Khmer Empire (ca. A.D. 1000) does mark the initial influence of a historic state in Northeast Thailand, and for this area, the Iron Age is entirely prehistoric. On a broader scale, the

latter half of the period can be considered as "protohistoric" in relation to early historic records from certain locations in Southeast Asia. This ending date can serve as a general representation of the development of complex and literate societies which eventually overshadow the initial significance of the prehistoric iron technology.

Settlement Expansion

The review of literature in Chapter 6 demonstrates that Iron Age sites are numerous. Even given sparse and uneven reporting of data, it is clear that there was a prehistoric expansion of settlement in terms of numbers of sites and their geographical spread. Further, there is some reason to believe that the expansion focused on the first millennium B.C., coeval with the development of iron technology. It is useful here to reiterate a point made earlier in this chapter; that these sites are considered here only to represent the settled portion of the population. It is possible that a whole class of sites -- that of nomadic hunter-gatherers on the plains -- may be missing from the present archaeological record.

Several surveys have now been accomplished across Northeast Thailand, but no sites as early or earlier than Non Nok Tha and Ban Chiang have been found (Figure 7-4 and see Figure 7-2). Only a few sites (Ban Tong, Ban Phak Top, Ban Nadi, and Ban Chiang Hian) have been found which predate



- ▲ Sites initially settled prior to 3000 BC
- Sites initially settled prior to 1000 BC
- ▨ Surveyed areas initially settled after 1000 BC
- ▩ Surveyed areas with no prehistoric settlement
- Other surveyed areas

Figure 7-4. Diagram of initial settlements in Northeast Thailand.

1000 B.C. It is likely that some "Ban Chiang tradition" sites on the northern Khorat Plateau, and some yet undated sites from the Mahasarakham and Kumphawapi survey areas predate 1000 B.C. Ban Kao and some other sites on the west side of central Thailand, and Kok Charoen on the east side of central Thailand, also predate the first millennium B.C. However, it is clear that sites this old are not as frequent as would be predicted from sequences which proposed settlement resulting from mass movements into certain localities. It can also be pointed out that the Ban Chiang Hian date conflicts with the notion of expansion of settlement into the Khorat Basin only after the development of irrigation rice agriculture. The date does not conflict, however, with the alternative model (Figure 7-1B) which suggests that early settlements resulted from an in situ shift in the subsistence base. Early plains settlement now appears to have arisen at a few scattered sites in several locales.

That the expansion of settlement occurred particularly in the first millennium B.C. is suggested, first, by survey data indicating that settlement in some areas first took place in this period, and second, by some indications that sites of this period are more numerous (Figure 7-4). The Phu Kradung ceramic sites from the Petchabun Piedmont evidently pertain to a period ca. 900-0 B.C. Sites in the Phimai and Roi Et survey areas all postdate 1000 B.C. The central plain of Thailand also appears to have been first

settled in this time. The clearest indication of a first millennium B.C. increase in numbers of sites is from the Phimai Survey (Welch 1981:Table 1). Only 3 of 14 habitation sites in the survey area have Tamyae ceramics (ca. 1000-500 B.C.). At least 9 of those 14 sites, plus the walled town and at least 3 of the 5 habitation sites outside the survey area, have Phimai ceramics (ca. 500 B.C. to A.D. 500). In Roi Et, only one of the three sites have Roi Et ceramics (ca. 500-0 B.C.) but all three have ceramics datable to A.D. 0-700 (Higham 1977). Ceramics from the Petchabun Piedmont Survey were so uniform that it was impossible to subdivide the period. Several sites in the Phu Wiang/Phu Kao area appear to correlate with later phases of Non Nok Tha but this situation is not at all clear. Sites in the Mahasarakham and Kumphawapi survey areas are largely undated due to lack of ceramics comparable to dated sequences.

There is not much evidence for continuation of the settlement expansion in the first millennium A.D. The Tak Det sites near the Mekong in the northern part of the Pa Mong Survey (Bayard 1980b) apparently represent some sparse prehistoric/early historic occupation in that previously unsettled area. In the Phimai area, all occupation sites have early historic (ca. A.D. 500 - 1300) ceramics. This represents a slight continued increase in site numbers from the Phimai phase (Welch 1981:Table 1). Two of the three Roi Et sites were initially occupied in the first millennium

A.D. However, settlement evidently did not continue into the historic period in the Roi Et survey area (Higham 1977). Both Non Nok Tha and Ban Chiang have gaps in their occupation in the first millennium A.D. (Bayard 1971a; Gorman and Charoenwongsa 1976). The mid-Loei valley area of the Pha Mong Survey remained unsettled until historic times (Bayard 1980b), as did the smaller area surveyed for the Lam Pao reservoir (Solheim and Gorman 1966). It may well be that the settlement pattern attained a plateau in terms of numbers of settlements in the first millennium A.D. Interestingly, Ng (1979:267) believes that settlement of marginal areas, in terms of paddy cultivation, is a relatively recent historic phenomenon.

The Iron Age Village

Village is a term commonly applied to habitation sites of some substance, ie. bigger than a camp, farmstead or hamlet, but smaller than a town (see numerous articles in Clarke 1972). The specific use of village as a description of the open occupation sites in Northeast Thailand and surrounding regions is based on an analogy with present villages, at least to the extent that present villages, apparently like the archaeological sites, are loci of occupation and some other activities set in an agricultural landscape.

Systematic recording of site size comes from three surveys; the Petchabun Piedmont Survey (Appendix B) where sites range from 0.2 to 4.0 ha., the Kumphawapi Survey (Kijngam et al. 1980) where sites range from 0.6 to 10.0 ha., and the Maharasarakham Survey (Kijngam et al. 1980) where sites range from 0.7 to 5.4 ha. (excluding Ban Chiang Hian, discussed below). The Petchabun sites are all Iron Age. Sites from the other two surveys can be tentatively included here based on dates from Ban Nadi and Ban Chiang Hian (see Chapter 6). All these prehistoric open occupation sites are large enough to contain at least a few dwellings. These sites are classed as villages.

Some sites which evidently pertain to the latter half of the period are large and have construction features which suggest a separate site type. Welch (1981) has defined Phimai as a "walled town." That site is 60 ha, and has both a stone wall and a large Khmer temple. Ban Chiang Hian is 38.7 ha. and has earthworks. Kijngam et al. (1980:59-66) used a mathematical model to demonstrate that the size of this site is too large to be "ordinary" and it is interpreted as a "major center." These data suggest that a distinctly larger and more complex site type was present by the end of the Iron Age. They are referred to as towns below.

In no case is the actual occupied area of a village at a given time known or even estimated. The data which are

available from excavations suggest that villages are generally loci of several activities which shift throughout the site's history. Thus, the presently known site sizes (usually crude estimates themselves) represent a general accumulation resulting from several interrelated activities over a span of time. Many of the excavated sites evidence patterns of abandonment and reoccupation as well.

Archaeological features and activity areas can be seen as the smallest recognizable units which compose the village site. Direct or indirect evidence is available for the following activities within Iron Age villages.

Occupation. In general, occupation is most often recognized by dense scatters and/or deposits of broken sherds and other domestic debris. More specifically, occupation is believed to be focused on houses built on piles in a manner somewhat similar to present village houses. These houses, then, are directly represented only by patterns of post holes. Non Nok Tha has the largest excavated area of any site in Northeast Thailand. At that site, Middle Period (2500 B.C. to A.D. 200) posthole patterns suggest to Bayard periodically rebuilt longhouse structures (Bayard 1971b: 188-206). Late Period (post-A.D. 1000) alignments are similar to modern houses. Watson (1968:305) also notes evidence for houses built on posts at Tha Muang, but provides no details of the post hole patterns. Post holes could also represent other structure types, such as animal

pens and food storage structures, but these have not been identified.

Inhumation Burial. Skeletal material, burial features and grave goods serve to indicate this specific activity. The relative abundance and elaboration of evidence for burial practices has generated some studies which purport to shed some light on village social structure (MacDonald 1980; Higham 1984).

Bronze Metallurgy. Tin bronze is a mixture of copper and tin. Smelting of copper is only known from one prehistoric context (Higham 1981). Presumably, smelting mainly took place at ore sources, and bronze casting in the village context generally began with imported ingots of tin and copper. Casting is a well documented village activity based on crucibles, casting spillage, molds, and casting furnaces.

Iron Metallurgy. While there is no known example of an iron smelting furnace from an Iron Age village, there is good reason to believe that iron smelting is widespread in association with village sites. Iron slag is found on the surface or in excavation of numerous sites in widespread areas as detailed in the previous chapter. The presence of this slag indicates that smelting took place in close association with, if not actually in, the villages. Clay/slag fragments, including some possible tuyere fragments, were found in the excavations conducted by the Petchabun Piedmont Survey, particularly at Ban I Loet. They are likely to be

fragments of destroyed smelting furnaces in those village sites. Individual smelting furnaces and larger iron working sites have been recorded in historic contexts. They are not within villages and suggest that iron working, while associated closely with villages, may have been a more dispersed activity.

Presumably, the ore for smelting the iron is laterite, since laterite is widespread while other ores are localized (Brown et al. 1951:72), and ironically, no prehistoric sites were found over much of the Loei valley which is in the vicinity of the largest sources of rich iron ores in North-east Thailand. The widespread nature of laterite iron ores contrasts with the restricted and separate sources of tin and copper ores necessary for production of bronze. This contrast suggests a rather profound shift in the resource base, which is discussed further below.

Pottery Manufacture. It makes sense that much of the ordinary pottery was of local manufacture, but there is little direct evidence of this. The presence of presumed pottery anvils on several sites may be cited as evidence.

Cloth Manufacture. This was a village activity following the assumption that the objects known as spindle whorls actually functioned as suggested.

Pit Features. Pit features (other than burials and post holes) are frequently described for archaeological sites but their functions are not discussed.

Particular aspects of some of the following activities also probably took place within the villages.

Village Catchment Area

Catchment analysis is a technique for examining the distribution of resources in the vicinity of an archaeological habitation site (Jarman 1972; Higgs and Vita-Finzi 1972; Jarman et al. 1972; Roper 1979). Here, the term catchment area is used in a general sense as the resource zone around a village. Evidence is available for several activities which took place within the catchment area of village sites.

Rice Agriculture. Cultivation of rice of some sort was present from the beginning of village settlement on the Khorat Plateau. White (1984) has suggested that it is most reasonable that rice cultivation began in small fixed fields. Evidence for rice production is of two kinds. Direct evidence is the presence of preserved rice husks, primarily as temper in ceramics. Circumstantial evidence is the location of most villages sites in the vicinity of areas suitable for wet rice cultivation. Two of the sites from the Petchabun Piedmont Survey are on upland stream terraces rather than riceland areas. However, rice chaff temper was found in crucible fragments from the excavation on one of these sites (Non Khaw Wong) and indicates some sort of association with rice even there.

From the developmental point of view, the advent of plowed paddy rice agriculture is highly important. Present evidence for this is from Ban Chiang and is based on three principle factors (Higham and Kijngam 1979; Higham et al. 1981).

1. Evidence that the domestic water buffalo were used for traction.
2. Disappearance of certain snail species which are abundant in wet lands and absent in paddy fields.
3. Presence of iron which presumably advanced the efficiency of plows, although no actual examples of prehistoric plows are known.

Other Plants. Identification of wild or domestic plant remains (other than rice) from open sites has not yet been accomplished. White (1982b; 1984) has recently completed an ethnobotanical study in the Ban Chiang area. Her work suggests that yam species may have been at least as important as rice in the diet. Small scale swidden cultivation of squash, beans and other species probably also played a role in subsistence. A variety of wild plants are also collected by present villagers, and this was probably also the case in the past. A variety of plant remains have been identified from Spirit Cave in the upland environment of North Thailand (Gorman 1972:Table 3).

Domestic Animals. Domestic cattle, pig, dog, and chicken are known from the beginning of village settlement.

Domestic water buffalo were added in the early Iron Age. The wild progenitors of all these animals, except the dog, are found in Southeast Asia. The cattle and water buffalo probably were stabled in the village and grazed in the surrounding area, based on observations in present villages. Pigs were more likely kept in the village and fed with vegetable material collected from the catchment area, again based on observations in modern villages.

Wild animals. Hunting of a variety of wild animals in association with plains settlement is indicated by the faunal remains identified from Non Nok Tha, Ban Chiang, Ban Phak Top, Ban Tong, and Don Klang (Higham 1975b; Higham and Kijngam 1979). Fish and other small animals were also present.

Regions

Within the more extensive, regional environments, some other site types are known. For the piedmont survey, cave sites appeared to be contemporary with and related to village occupation. It seems likely that they were used as temporary shelter for villagers while hunting, collecting, or working dry crop fields far from the village. Thus, they may have functioned as satellite sites which extended the village catchment area. Some very late, modified Hoabinhian cave sites are contemporary with Iron Age villages in some

regions. Superficially at least, they suggest a different cultural orientation but this is not at all clear. A stone working site, attributed to the Hoabinhian, is known along the bank of the Mekong in Loei Province. It is presently an isolated phenomenon, although it can be said that this general area has some possibly related late prehistoric sites. Salt working sites which pertain to this period are known in Mahasarakham and Roi Et. Although occupation debris is present on one (Bo Phan Khan), these sites seem to be generally restricted to salt processing, presumably by the inhabitants of villages in the vicinity. The previously mentioned town sites should also be iterated here.

That regional organizations of some sort are present is indicated by present data, but its nature is very unclear. There are two principle arguments for a second tier of the settlement system. First is the clustering of ceramics across Northeast Thailand. Pottery in each of the surveyed areas reviewed in Chapter 6 is internally similar but quite distinct from its nearest neighbors. One might expect some sort of clinal distribution between areas, but the only defined cluster, the Phu Kradung ceramic sites, indicates a sharply defined boundary. This clustering of pottery implies a regionalization within which, minimally, pottery was traded, or manufactured in individual villages in mutual contact.

The second argument involves the previously mentioned town sites. The size and structural features of these sites suggest that they served as central places for a regional group of villages. Kijngam et al. (1980) draw the conclusion that their data demonstrates prehistoric state formation on the Khorat Plateau. This is interesting data, but there are a number of problems in accepting this conclusion (Wilén 1984; Penny 1984). It is clear that some sort of centralization was taking place, but definition of state formation does not appear to be warranted.

There is evidence of trade reaching across regions and to the world horizons of the Iron Age villagers. This survey found a painted lid in excavations at Non Khaw Wong which is strikingly similar to lids from Don Klang which is 60 km distant in an area where the other ceramics are dissimilar. Other archaeologists have noted small quantities of ceramics which resemble ceramics from sites in other ceramic regions. Ceramic similarities should be handled with care. The present data do not actually demonstrate trade of ceramics, but at least suggests some kind of mutual contact. Production of tin bronze requires both copper and tin which are not found anywhere in the same vicinity, and neither are found over most of northeast Thailand. Hence, trade in these raw materials is strongly suggested for bronze working sites in this area, although actual source areas are not known. For Northeast Thailand, this trade need not have

extended much beyond regional borders, but the trade could have involved greater distances and other items. The small glass beads which were found in the excavations of this project appear to have great potential for study of trade networks. Unfortunately, very few have been reported. They are often very small and many were probably overlooked by excavators. Beads of similar appearance have been reported from Ban Kao and Ban Chiang. Evidence of glass manufacture was found at Tha Muang, but the A.D. 400 dates indicate that this was not the source of the beads found in this survey. These beads may well have been traded over very wide areas. Salt was probably also important in trade. Interestingly, salt formations are widespread across Northeast Thailand (United Nations 1968:48; Haworth et al. 1966:Plate 13), and salt production may have been more important in long distance trade than locally. By the end of the Iron Age there is evidence of widespread trade, including items traded from India at Chansen (Bronson 1979) and items traded to India at Ban Don Tha Phet (Glover 1980).

Conclusions

Summary

An archaeological survey was conducted covering eleven 10-km grid squares (1100 km²) along the western, Petchabun Mountain piedmont borders of the Khorat Plateau, Northeast

Thailand. Subsequently, small test excavations were conducted on three of the sites: Non Khaw Wong, Ban I Loet, and Ban Puan Phu. The excavated sites had similar ceramics and a similar assemblage of other artifacts, including clay balls, spindle whorls, crucible fragments, bronze artifacts and detritus, iron artifacts and detritus, small glass beads, and slag. Available dates indicate that these sites pertain to a period ca. 900 - 0 B.C. There were few distinctive ceramics, and this period could not be subdivided on present evidence. Similarities in surface ceramics suggest that all of the unexcavated prehistoric open sites pertain to the same cultural cluster designated the Phu Kradung ceramic sites. Three sites from the contiguous, southernmost area of the Pa Mong Survey are also clearly candidates for the same cluster as judged from descriptions of their ceramics. The general distribution of these sites suggests that they cover an area ca. 100 x 30 km along this border of the Khorat Plateau.

These results contradict the expectations for this survey which were derived from extant models of autochthonous cultural development in Southeast Asia. The models of Solheim, Higham, and Gorman predicted that Hoabinhian (ca. 15,000 - 7000 B.C.), transitional (ca. 7000 - 4000 B.C.), and early village farming (ca. 4000 - 1000 B.C.) sites would be present in such a piedmont zone, and that they would reflect a transition from mountain-oriented

hunting and gathering to plains-oriented settled agriculture. The absence of the expected sites called for a reevaluation of the models which predicted them. A number of alternatives were discussed. The transition may have taken place along other piedmont margins. The transition may have taken place as suggested, but in a form not detected by this research. It is also possible, but apparently only remotely, that agriculture was introduced from outside Southeast Asia after all. Another alternative model was introduced which essentially proposes that village agriculture arose from a milieu of plains hunter-gatherer-protocultivator groups. This is a "step" model which proposes that early village farming arose abruptly with a shift to fixed-field agriculture and long-term settlement. Thus, it is a theoretical alternative to the "ramp" transition envisioned by Gorman. This is only a logical alternative since there is no archaeological evidence for pre-village plains groups, although there is some circumstantial support for this view of development.

The data from this survey and a review of available data from surrounding regions have suggested definition of a Southeast Asian Iron Age. The earliest reasonable dates for this period place its beginning near 1000 B.C. and it was fully developed and widespread by ca. 500 B.C. Here, this period is considered as continuing through a "protohistoric" period (ca. A.D. 0-1000) and ending, rather arbitrarily, at

historic times. Sites which can be related to this period evidence a widespread expansion of settlement across Southeast Asian plains and into piedmont margins. These sites continue a pattern of village settlement, rice agriculture, domestic cattle and pig, and bronze metallurgy which were present from at (or near) the time of earliest plains settlement, as well as hunting and gathering of earlier periods. Major developments are iron itself, domestic water buffalo, and paddy rice agriculture. Also in the latter half of the period, there is evidence of sites which served as central places of some sort, as indicated by their significantly larger size and structural features.

New Directions: The Research
in Theoretical Perspective

The data from the Petchabun Piedmont Survey, and other archaeological work considered in this report, present quite a different picture of prehistorical cultural development from that expected. In theoretical terms, these results had two major thrusts. One was to question extant models of cultural development, and the second was to initiate development of new models regarding the importance of the Southeast Asian Iron Age. These results suggest some new directions which can be pursued in Southeast Asian studies.

The origins of rice agriculture on the plains of Southeast Asia remain shrouded in mystery. Neither an indigenous

transformation nor an influx of agriculturists from adjacent regions have been demonstrated. The discussion at the beginning of this chapter outlines several alternatives which may be investigated in future archaeological work. The importance of ecological studies has also been stressed (and see White 1984). A special need for creativity in archaeological survey methods is highlighted by the lack of data to support any of the alternatives clearly. In particular, there is an apparent need for more intense surveys which might reveal difficult-to-find sites which are suggested by some of the alternatives. Present survey methods are strongly oriented to certain "central place" sites, namely mound and cave/rockshelter sites. The results of the piedmont survey suggest that sites representing the transition to agriculture may not be such "central places." Richard Wilen (personal communication 1984), a University of Hawaii graduate student, is conducting a transect survey which is interesting in this regard. He planned to conduct survey in 500-m square grid units allowing time for intense on-foot survey. This transect is of particular interest here since it lies between the Petchabun Piedmont Survey area and Phu Wiang, where Non Nok Tha and other sites are located (see discussion of Petchabun Piedmont and Piedmont Outliers subregions in Chapter 6). In a sense, the piedmont survey represented a simple possible solution to the problem of the origins of Southeast Asian agriculture. The problem

should now be seen as a difficult one and treated accordingly.

The importance of the Southeast Asian Iron Age is emphasized by two points made above; first, that an impressive expansion in both extent and density of settlement occurred during the period, and second, that the period evidently witnessed the advent of a very important economic/technical complex including iron production, domestic water buffalo for traction, and paddy rice agriculture. Iron, water buffalo, and paddy rice (along with village settlement continuing from earlier) are key elements of the present-day settlement system. Continuity of these elements over the millennia testify to the stability and importance of iron age developments.

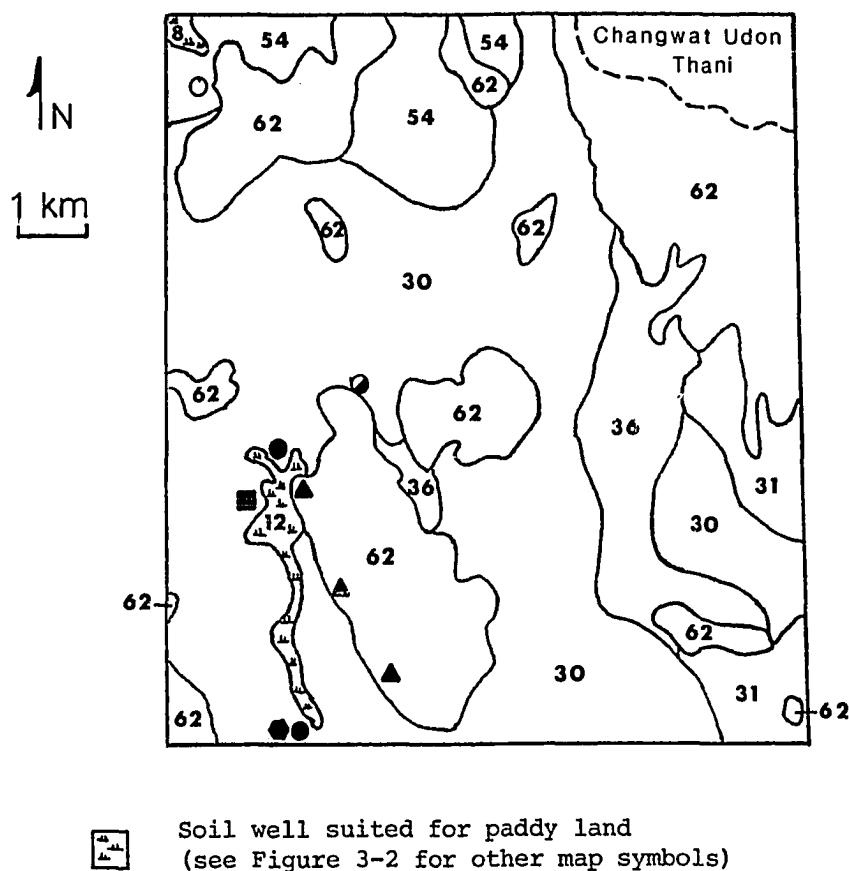
A major puzzle remains. Given the spread of plant and animal domestication, the advances in metallurgy and the development of trade, it is surprising that the entire Extensionistic period was unmarked by the kind of social evolution that accompanied the same events in the middle east... [until] as a result of Indian political and religious influences, the first civilized states finally made their appearance in the region... (Solheim 1972:41).

I have suggested elsewhere (Penny 1984) that village-level access to key resources (especially riceland and iron) and the dispersed settlement pattern provide at least a partial answer to Solheim's puzzle. The timing and nature of state development in Southeast Asia promises to be a rich field of study which could have major influences on general models of cultural evolution.

The data which suggest that key elements of the present-day settlement system had their origins in the Iron Age, or earlier, also highlight the importance of historical studies. Both document studies and historic archaeology studies could be applied to link late prehistory with the present in terms of continuities (eg. village settlement and paddy rice) and discontinuities (eg. the eventual development of states and the introduction of Buddhism) which are now evident.

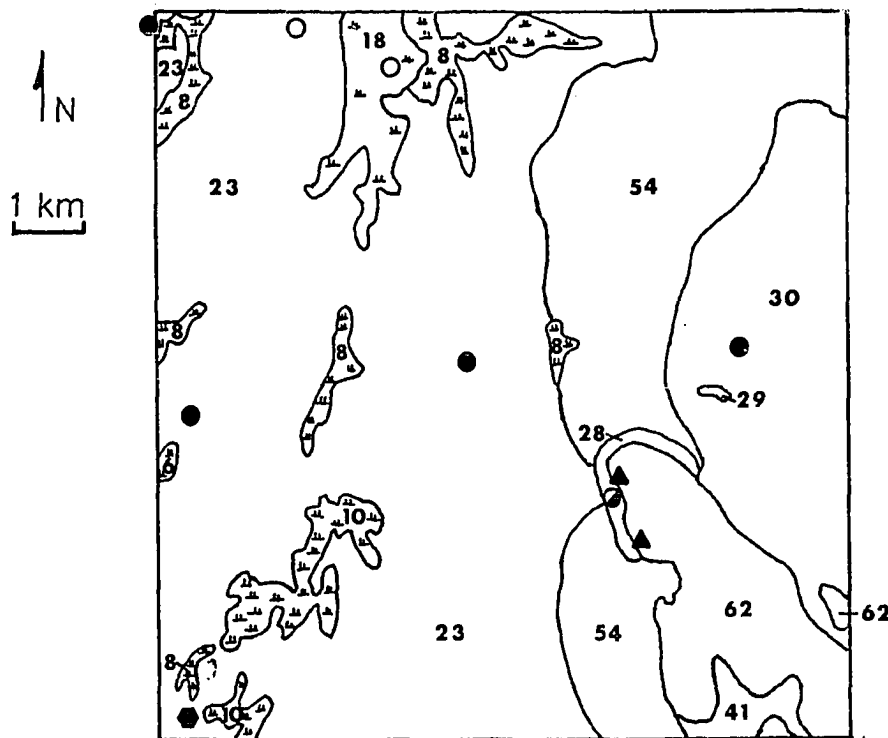
The unexpected results of the Petchabun Piedmont Survey point to interesting new directions in Southeast Asian studies.

APPENDIX A
SURVEY SQUARE SOIL MAPS



Map Unit	Series	Class
8	Mae Sai	Hydromorphic Non-Calclac Brown Soils
12	Phan	Low Humic Gley Soils
30	Wanghai	Reddish-Brown Lateritic Soils
31	Wang Saphung	Reddish-Brown Lateritic Soils
36	Pak Chong	Reddish-Brown Lateritic Soils
54	Tha Li	Reddish-Brown Lateritic Soils
62	Slope Complex	Various

Figure A-1. Square 3315 soils (adapted from Soil Survey Division 1975).



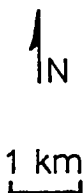
Soils well and very well suited for paddy land



Soil association, portions well suited for paddy land
(see Figure 3-3 for other map symbols)

Map Unit	Series	Class
6	Saraburi	Hydromorphic Alluvial Soils
8	Mae Sai	Hydromorphic Non-Calcic Brown Soils
10	Hang Dong	Low Humic Gley Soils
18	Nakon Phanom/ That Phanom	Low Humic Gley Soils and Non-Calcic Brown Soils
23	Phon Phisai	Red-Yellow Podzolic Soils
28	Loei	Reddish-Brown Lateritic Soils
29	Chaing Khan	Reddish-Brown Lateritic Soils
30	Wanghai	Reddish-Brown Lateritic Soils
41	Wanghai/ Wang Saphung	Reddish-Brown Lateritic Soils
54	Tha Lai	Reddish-Brown Lateritic Soils
62	Slope Complex	Various

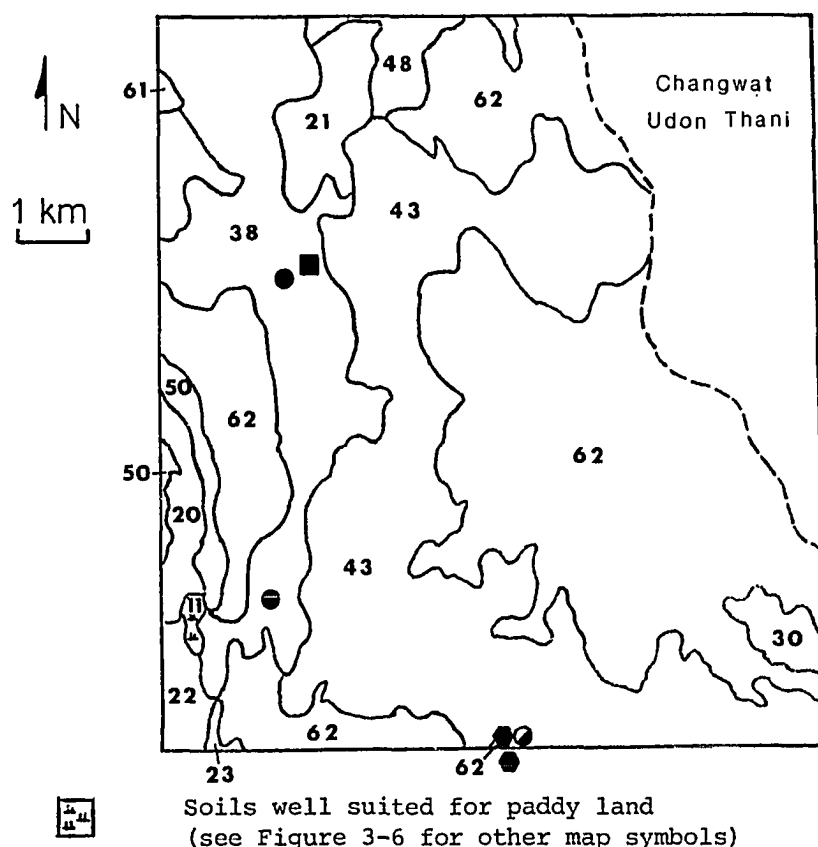
Figure A-2. Square 3415 soils (adapted from Soil Survey Division 1975).



Soils well and very well suited for paddy land
(see Figure 3-5 for other map symbols)

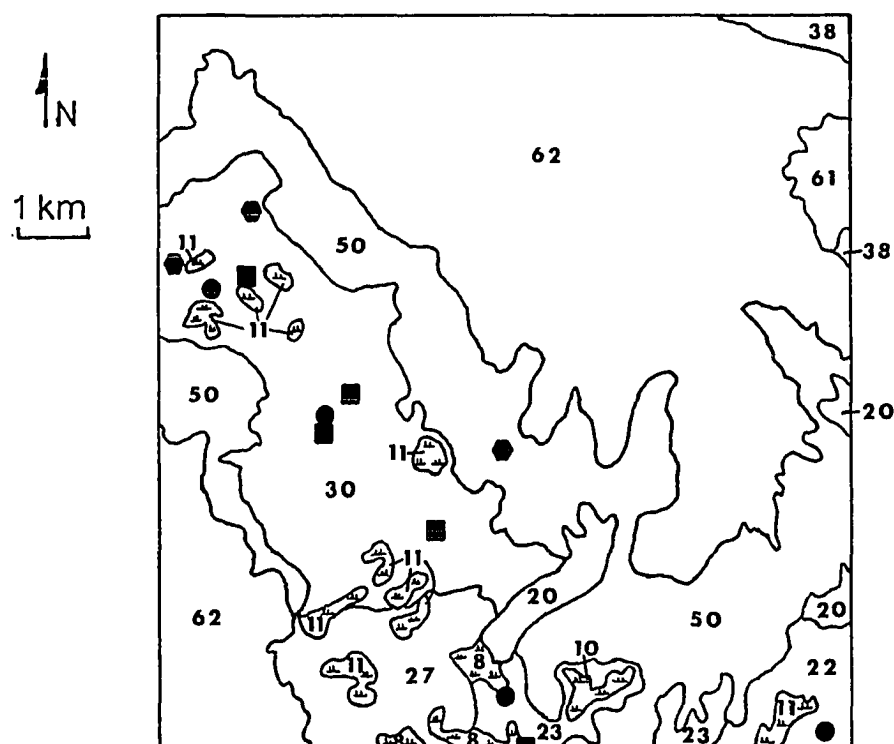
<u>Map Unit</u>	<u>Series</u>	<u>Class</u>
6	Saraburi	Hydromorphic Alluvial Soils
8	Mae Sai	Hydromorphic Non-Calcic Brown Soils
23	Phon Phisai	Red-Yellow Podzolic Soils
30	Wanghai	Reddish-Brown Lateritic Soils
32	Muang Lek	Non-Calcic Brown Soils
33	Li	Reddish-Brown Lateritic Soils
36	Pak Chong	Reddish-Brown Lateritic Soils
54	Tha Li	Reddish-Brown Lateritic Soils
62	Slope Complex	Various

Figure A-3. Square 3515 soils (adapted from Soil Survey Division 1975).



Map Unit	Series	Class
11	Chiang Rai	Low Humic Gley Soils
20	Valley Fill Complex	
21	Renu	Hydromorphic Gray Podzolic Soils
22	Khorat	Gray Podzolic Soils
23	Phon Phisai	Red-Yellow Podzolic Soils
30	Wanghai	Reddish-Brown Lateritic Soils
38	Chatturat	Red-Brown Earth Soils
43	Muang Lek/ Tha Yang	Non-Calciic Brown and Red-Yellow Podzolic Soils
48	Tha Yang	Red-Yellow Podzolic Soils
50	Lat Ya/ Tha Yang	Red-Yellow Podzolic Soils
61	Rocky Lands	
62	Slope Complex	

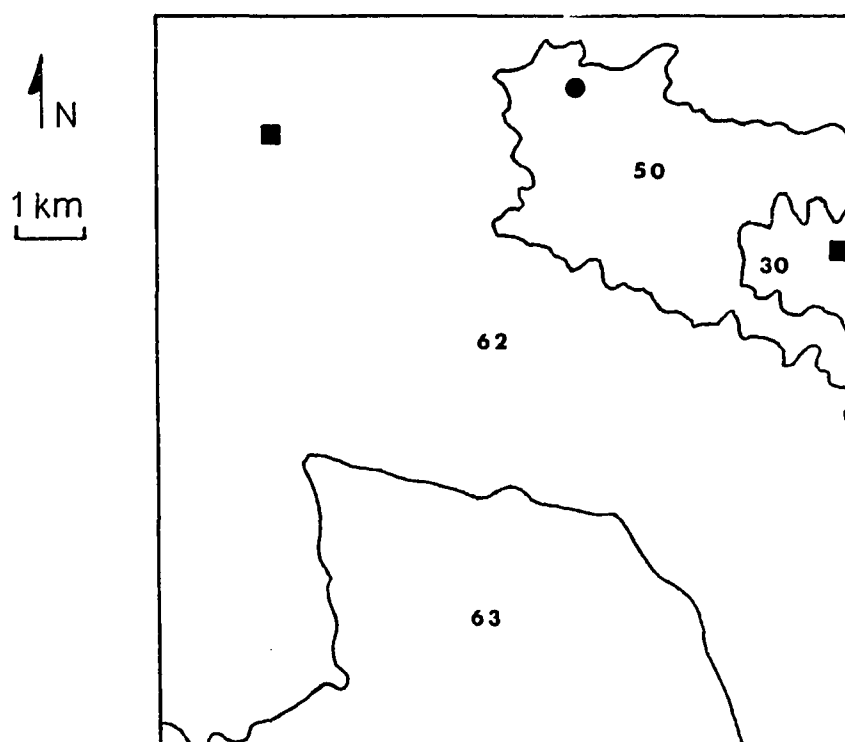
Figure A-4. Square 3317 soils (adapted from Soil Survey Division 1975).



Soils well suited for paddy land
(see Figure 3-9 for other map symbols)

Map Unit	Series	Class
8	Mae Sai	Hydromorphic Non-Calcic Brown Soils
10	Hang Dong	Low Humic Gley Soils
11	Chiang Rai	Low Humic Gley Soils
20	Valley Fill Complex	
22	Khorat	Gray Podzolic Soils
23	Phon Phisai	Red-Yellow Podzolic Soils
27	Satuk	Red-Yellow Podzolic Soils
30	Wanghai	Reddish-Brown Earth Soils
38	Chatturat	Red-Brown Earth Soils
50	Lat Ya/ Tha Yang	Red-Yellow Podzolic SOils
61	Rocky Lands	
62	Slope Complex	

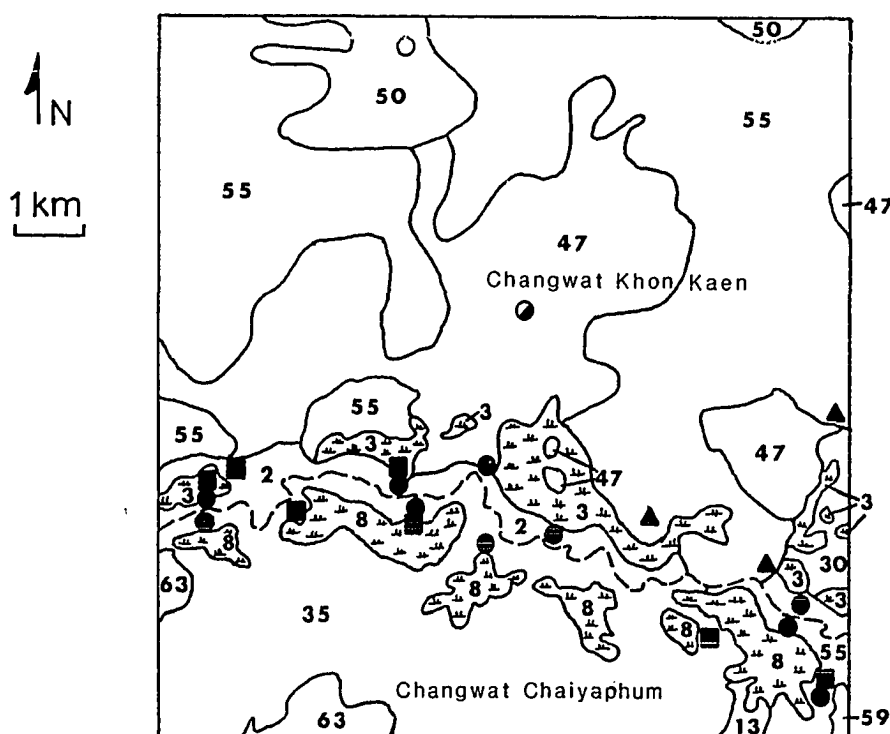
Figure A-5. Square 3417 soils (adapted from Soil Survey Division 1975).



No soils well suited for paddy land in this square
(see Figure 3-10 for other map symbols)

<u>Map Unit</u>	<u>Series</u>	<u>Class</u>
30	Wanghai	Reddish-Brown Lateritic Soils
50	Lat Ya/ Tha Yang	Red-Yellow Podzolic Soils
62	Slope Complex	
63	Complex Soils on High Plateau	

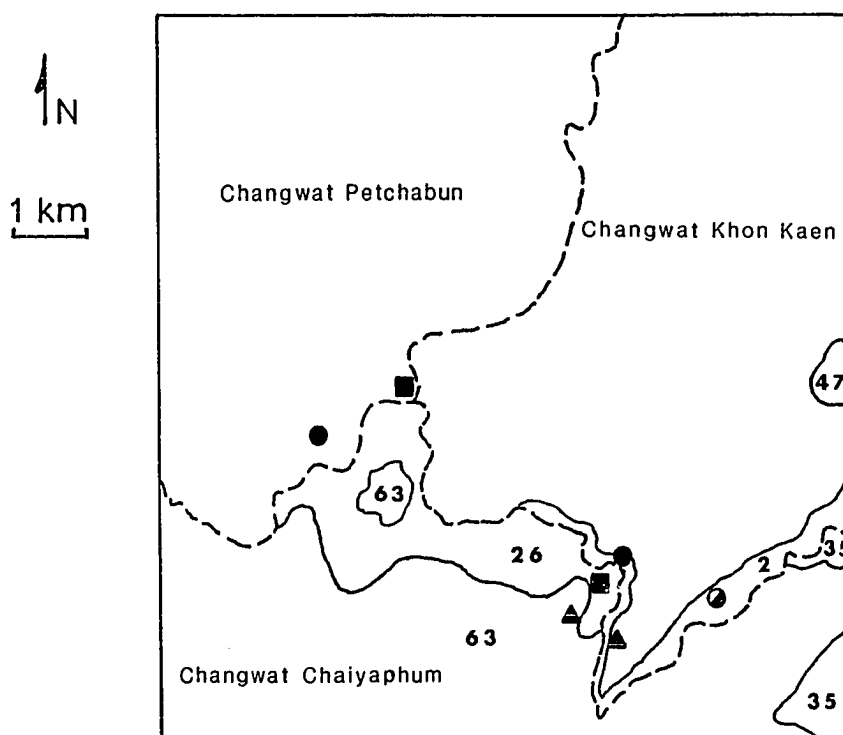
Figure A-6. Square 3517 soils (adapted from Soil Survey Division 1975).



Soils well and moderately well suited for paddy land
(see Figure 3-11 for other map symbols)

Map Unit	Series	Class
Changwat Khonkaen		
2	Tha Muang	Alluvial Soils
3	Sanphaya	Alluvial Soils
30	Phon Phisai	Red-Yellow Podzolic Soils
47	Pak Chong	Reddish-Brown Lateritic Soils
50	Ban Chong	Reddish-Brown Lateritic Soils
55	Slope Complex	
Changwat Chaiyaphum		
8	Ratchaburi	Hydromorphic Alluvial Soils
13	That Phanom	Non-Calcic Brown Soils
35	Korat/Warin	Gray Podzolic and Red-Yellow Podzolic Soils
55	Lam Narai, dark surface variant	Brown Forest Soils
59	Takhli, hydromorphic variant	Redzinas
63	Slope Complex	

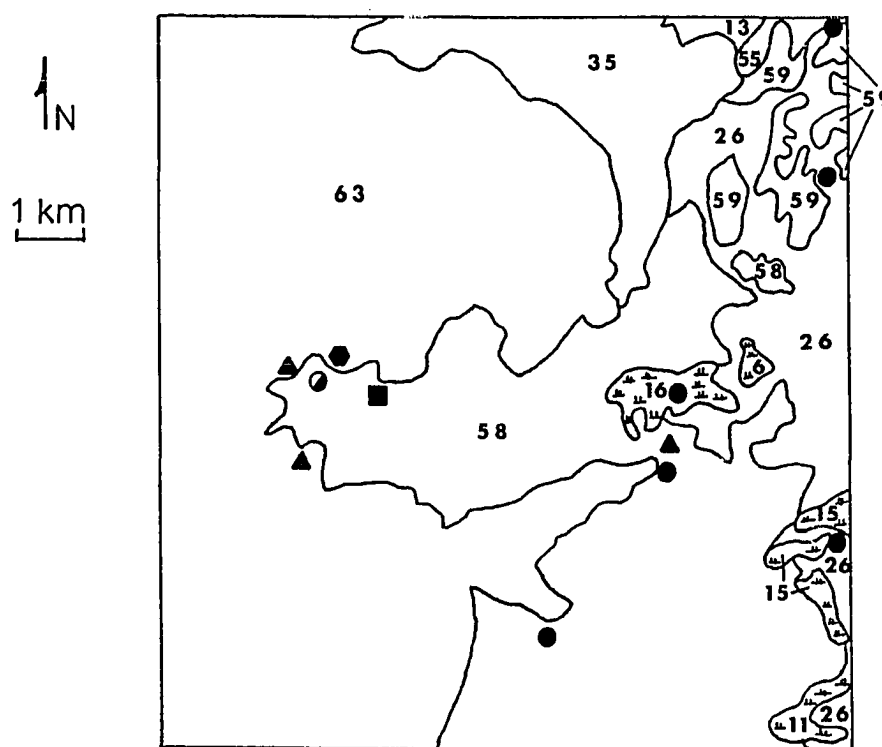
Figure A-7. Square 3420 soils (adapted from Soil Survey Division 1973a, 1973b).



No soils well suited for paddy land in this square
(see Figure 3-12 for other map symbols)

Map Unit	Series	Class
Changwat Khon Kaen		
2	Tha Muang	Alluvial Soils
47	Pak Chong	Reddish-Brown Lateritic Soils
55	Slope Complex	
Changwat Chaiyaphum		
26	Korat	Gray Podzolic Soils
35	Korat/ Warin	Gray Podzolic and Red-Yellow Podzolic Soils
63	Slope Complex	
Changwat Petchabun		
(soil map not available)		

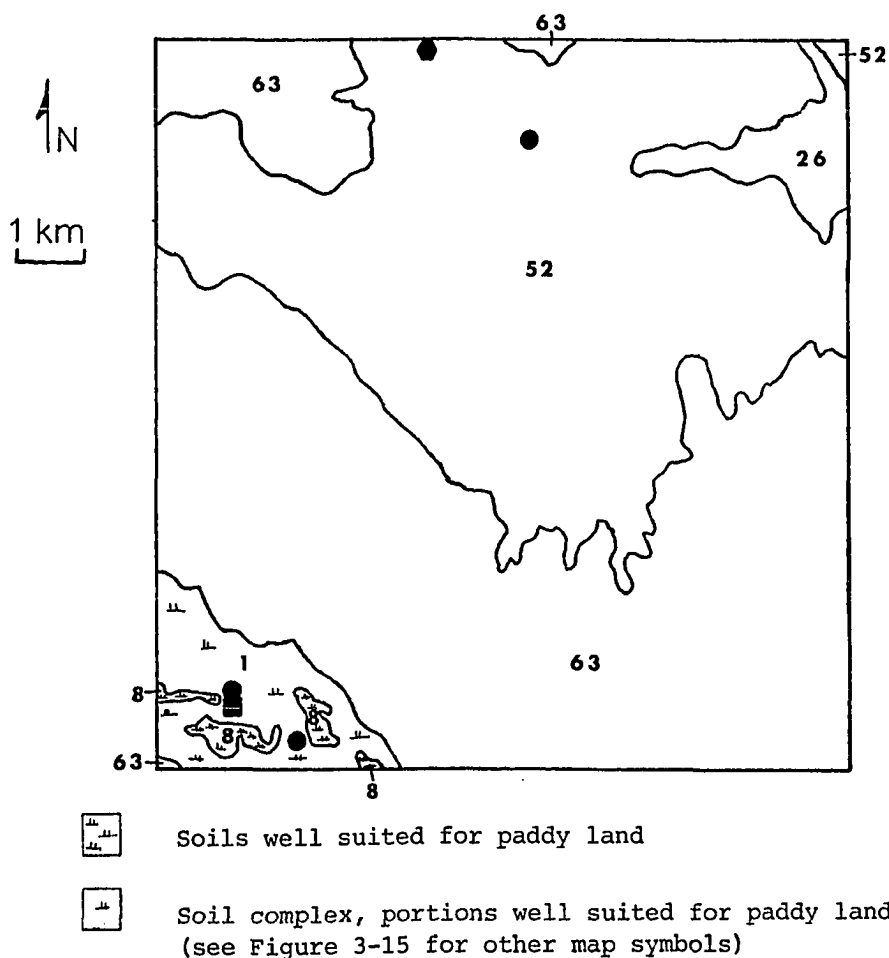
Figure A-8. Square 3520 soils (adapted from Soil Survey Division 1973a, 1973b).



Soils moderately well suited for paddy land
(see Figure 3-13 for other map symbols)

Map Unit	Series	Class
11	Chaiyaphum	Hydromorphic Alluvial Soils
13	That Phanom	Noncalcic Brown Soils
15	Roi Et	Low Humic Gley Soils
16	Roi Et, loamy variant	Low Humic Gley Soils
26	Korat	Gray Podzolic Soils
35	Korat/ Warin	Gray Podzolic and Red-Yellow Podzolic Soils
55	Lam Narai, dark surface variant	Brown Forest Soils
58	Takhli	Redzinas
59	Takhli, hydromorphic variant	Redzinas
63	Slope Complex	

Figure A-9. Square 3421 soils (adapted from Soil Survey Division 1973b).



Map Unit	Series	Class
1	Alluvial Complex	
8	Ratchaburi	Hydromorphic Alluvial Soils
26	Korat	Gray Podzolic Soils
52	Phon Phisai/ Borabu Complex/ Warin Shallow	Red-Yellow Podzolic Soils
63	Slope Complex	

Figure A-10. Square 3423 soils (adapted from Soil Survey Division 1973b).

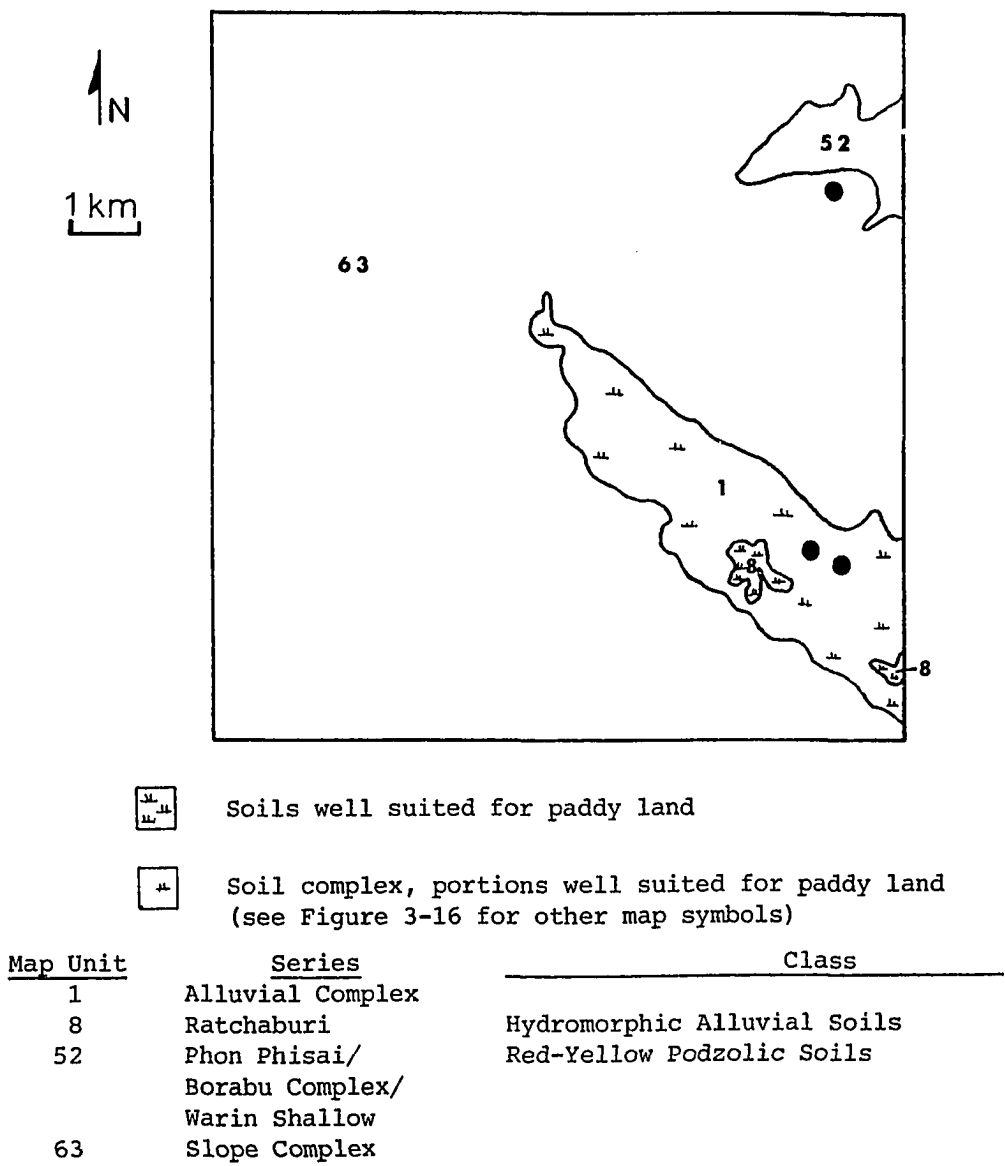


Figure A-11. Square 3523 soils (adapted from Soil Survey Division 1973b).

APPENDIX B
SURVEY SITE DESCRIPTIONS
BY SITE NUMBER

Amphoe Lom Kao, Changwat Pethchabun
(16.01)

Site 16.01-1

Name. Huai Fai Mai

General Location. In Square 3520 (Figure 3-12) on the terrace above the stream about 1.5 km northeast of Ban Huai Sanam Sai.

Latitude/Longitude. 16° 40' 00" N, 101° 45' 15" E

Description. The extent of this open site, which was in dense brush, could not be determined. Cordmarked and plain sherds were found around the landowners house and in the bank of the terrace near the house. Twelve rim sherds and two decorated body sherds were analyzed. All these sherds were tempered with mineral grains (10 with sand and 4 with mixed minerals). The rims were all smooth. Rim forms are discussed in Chapter 5. Two of the rims included codable fragments of the vessel body: one body was cordmarked, and the second had an applique on smooth surface. One of the analyzed body sherds had a band of smoothing on cordmarking and the second had an applique on cordmarking. Interestingly, the landowner said that he found a lot of "beads" when digging in his fields. He made a model of clay to demonstrate how they looked; they were clearly spindle whorls. This man also told of finding a groundstone axe while digging about 1 m down in an area about 30 m north of the house. Another informant showed the survey party three groundstone axes he attributed to this site area. They were small, and simple rectangular in form, similar to those in Duff (1970) Type 2.

Environmental Zone. Terracelands (Zone 3)

Elevation. 260 m

Geology. Phu Kradung Formation

Water. The stream about 150 m east of the site is perennial

Soil. Slope Complex

Amphoe Phu Kradung, Changwat Loei
(17.09)

Site 17.09-1

Name. Ray Saw

General Location. In Square 3517 (Figure 3-10) about 4.5 km southeast of Ban Wang Yang.

Latitude/Longitude. 16° 57' 25" N, 101° 48' 50" E

Description. This is a small open site of approximately 30 x 50 m which appeared to be a low mound, 1 - 2 m high. The site was partly dug away on the north side for road fill, and most of the collected pottery was found in this area. Seven rim sherds were analyzed. All were mineral tempered; 5 with sand and 2 with mixed mineral grains. Six of the rims were plain and one had some glaze present. Rim forms are discussed in Chapter 5.

Environmental Zone. Terracelands (Zone 3)

Elevation. 270 m

Geology. Phu Kradung Formation

Water. A spring is located on the south side of the site. The Lam Phong Ko is ca. 200 m south. What may have been an old river channel lies only a few meters north of the site.

Soil. Reddish-Brown Lateritic Soils

Site 17.09-1

Name. Jar Burial 1

General Location. In Square 3417 (Figure 3-9) in the side of a road cut approximately 0.5 km west of Ban I Loet.

Latitude/Longitude. 16° 57' 15" N, 101° 49' 15" E

Description. This site is probably the remains of a single jar burial. Little remained of the site when it was inspected. Some cordmarked body sherds and some bone, including a human tooth, were recovered from an area 30-40 cm wide, 50 cm high, and 30 cm deep into the bank. This area was approximately 50 cm below the ground surface. Jar burials are not usually found with cordmarked pottery, but there appears to be no other explanation for this site.

Environmental Zone. Terracelands (Zone 3)

Elevation. 260 m

Geology. Phu Kradung Formation

Water. Site located near the Lam Phong Ko

Soil. Reddish-brown Lateritic Soils

Site 17.09-3

Name. Ban I Loet

General Location. In Square 3417 (Figure 3-9) approximately 200 m east across the Lam Phong Ko from the village of Ban I Loet.

Latitude/Longitude. 16° 57' 15" N, 101° 49' 40" E

Description. Ban I Loet is a open site on a ridge which rises about 5 m above the paddys which border the site on the south and west. Artifacts were found in the bank of the Huai Dua on the north side of the site. To the east, there is no clear boundary, but no artifacts were found in the bank of the Huai Dua where it passes east of the site. The site is estimated to be 150 m in diameter. There were indications that the deposit could be of considerable depth. Surface finds indicative of a fairly rich deposit were found, primarily along the eroded cart track which crossed the site. Seventeen rim sherds and five decorated body sherds were analyzed. All of the analyzed sherds were tempered with mineral grains; primarily sand (13 of 17 rims and all body sherds), and also mixed minerals (3 rims) and laterite (1 rim). One rim was burnished, and the remainder had plain, smooth finishes. Rim forms are similar to the excavated rims from this site discussed in Chapter 5. Three rims included codable portions of the vessel body; two of these bodies were cordmarked and one (the burnished rim) was burnished. Three of the five analyzed body sherds had incising on cordmarking, one had incising on plain surface, and the last had a series of impressions on plain surface. A small groundstone adze/axe and two small dark blue translucent glass beads were also found. A spindle whorl attributed to this site was given to the survey team in nearby Ban Si Tha Wan. This site was selected for excavation (Chapter 4).

Environmental Zone. Terracelands (Zone 3)

Elevation. 255 m

Geology. Phu Kradung Formation

Water. The perennial Lam Phong Kho is less than 0.5 km southwest, and the seasonal Huai Dua borders the site on the north.

Soil. Reddish-Brown Lateritic Soils

Site 17.09-4

Name. Jar Burial 2

General Location. In Square 3417 (Figure 3-9) about 1 km north of Ban I Loet.

Latitude/Longitude. 16° 57' 30" N, 101° 49' 30" E

Description. No surface feature was observed in this area. Some unglazed stoneware sherds were recovered. The informant had seen bones with the pottery, and identified the site as the burial of a jar with the bones of an ancestor.

Environmental Zone. Terracelands (Zone 3)

Elevation. 260 m

Geology. Phu Kradung Formation

Water. No perennial sources are known in the area. The seasonal Huai Dua and Huai Phaeng Ma are near the site.

Soil. Reddish-Brown Lateritic Soils

Site 17.09-5

Name. Ban Si Tha Wan 1

General Location. In Square 3417 (Figure 3-9) in the immediate vicinity of the village of Ban Si Tha Wan.

Latitude/Longitude. 16° 56' 15" N, 101° 50' 30" E

Description. The area of this open site is unknown. There is no obvious mound or surface features. Cordmarked pottery was shown to the survey party by villagers who said they had found the sherds in construction activities in the village area. Similar pottery was recovered by the survey party at the base of a tree pushed over in the process of clearing an area near the center of the village. Four rim sherds and one decorated body sherd were analyzed. All the sherds are sand tempered. The rims are all smooth and one includes a portion of the cordmarked vessel body. Rim forms are discussed in Chapter 5. The body sherd has incising on cordmarking. Other artifacts in possession of villagers were a simple rectangular ground stone adze/axe, similar to those in Duff (1970) Type 2, and some iron slag. The adze/axe was said to have been found in village construction. The slag was said to have been found in the river bank north of the village, but none was observed when the informant showed the location to the survey party.

Environmental Zone. Terracelands (Zone 3)

Elevation. 260 m

Geology. Phu Kradung Formation

Water. The site borders the Lam Phong Ko

Soil. Reddish-Brown Lateritic Soils

Site 17.09-6

Name. Ban Si Tha Wan 2

General Location. In Square 3417 (Figure 3-9) on the opposite bank of the Lam Phong Ko from 17.09-5.

Latitude/Longitude. 16° 56' 15" N, 101° 50' 30" E

Description. The area of this open site is also unknown. Pottery was found only on the north side where erosion was resulting from clearing of the land for dry crops. Informants indicated that similar pottery had been found in the site area when they dug down about half a meter. Two rim sherds were analyzed. Both are sand-tempered and smooth, and one has a stamped design on the body portion. Rim forms are discussed in Chapter 5.

Environmental Zone. Terracelands (Zone 3)

Elevation. 260 m

Geology. Phu Kradung Formation

Water. The site borders the Lam Phong Ko

Soil. Reddish-Brown Lateritic Soils

Site 17.09-7

Name. Non Noy

General Location. In Square 3417 (Figure 3-9) about 2.5 km north of Ban Na Paen

Latitude/Longitude. 16° 56' 15" N, 101° 51' 30" E

Description. This site is a small mound which is approximately round, 8 m in diameter and 1 m high. Numerous orange prepared-clay-tempered sherds were found eroding from one side of the mound. Nine rims were analyzed. All were plain and eight had a series of impressions around the body. This site was said to have bad spirits which harm anyone taking things from this area. A spirit house was built here at the time of construction of the nearby small dam. There was evidence of modern camping in the area. The pottery appeared to be modern. The origin of the site is not known.

Environmental Zone. Terracelands (Zone 3)

Elevation. 270 m

Geology. Phu Kradung Formation

Water. No perennial source was located nearby, but the site is near a seasonal stream.

Soil. Red-Yellow Podzolic

Site 17.09-8

Name. Non Thon

General Location. In Square 3417 (Figure 3-9) about 1.5 km NNW of Ban Na Paen, on the opposite bank of the Lam Phong Ko.

Latitude/Longitude. 16° 55' 20" N, 101° 51' 05" E

Description. This site appears to be a low mound about 100 m in diameter. The mound appears to rise approximately 3 m above the surrounding paddy fields and dry crop land. The site itself was planted in corn at the time of the investigation. Few sherds were found over the surface of the mound; most were found in an area of dam construction on the northwest side of the site. "Many" stone adze/axes were said to have been found in dam construction, but none were shown to the survey party. Eighteen rim sherds were analyzed from the surface collection. All were tempered with sand and all were plain. Rim forms are discussed in Chapter 5. One rim included a portion of the vessel body which was smooth and had indications of red paint. Two areas of erosion near the dam were cleared to reveal part of the stratigraphy and indicate at least 1 m of deposit.

Environmental Zone. Terracelands (Zone 3)

Elevation. 250 m

Geology. Phu Kradung Formation

Water. Water would have been available both from the Lam Phong Ko on the west side of the site, and from the seasonal stream on the north.

Soil. Reddish-Brown Lateritic Soils

Site 17.09-9

Name. Na Phi Ton

General Location. In Square 3417 (Figure 3-9) about 1.5 km south of Ban Na Paen, along the road to the Amphoe seat.

Latitude/Longitude. 16° 54' 00" N, 101° 51' 45" E

Description. This open site appears to be a low mound with an area of at least 110 x 140 m. Site boundaries are obscured by vegetation, and road

and paddy construction. An old historic irrigation ditch was visible on the site. An informant described an old wat south of the site. He had seen the old boundary stones while clearing land. The survey party was unable to relocate the stones. The name of the site refers to a story told by the informant from the time of his grandfather. Spirits had pulled rice out of the paddys in this area, but were placated by offerings and do not do this mischief anymore. Sherds were found on the mound east of the road, in the road, and in a small area west of the road. Seven rims and one decorated body sherd were analyzed from the surface collection. All were sand tempered and all the rims were plain. Rim forms are discussed in Chapter 5. The body sherd had an incised design. An informant said that the site must have been an old pottery-making village from the quantity of sherds found in digging in the fields. A groundstone adze/axe and a bronze axe were shown to the survey party. Their provenience was identified as the area of the old irrigation ditch on the site. The adze/axe was of highly polished dark green/black stone and was shouldered, like some in Duff (1970) Type 8. The bronze axe appeared to be cast. The inside of the socket was obscured by a wooden handle inserted by the owner. A small piece of corroded bronze was found in the road at this site. Some pieces of brick were found on the site; they may refer to the old wat site.

Environmental Zone. Terracelands (Zone 3)

Elevation. 250 m

Geology. Phu Kradung Formation

Water. Available from the Lam Phong Ko east of the site, from the seasonal stream north of the site, and from a former spring located in the area of the old wat south of the site.

Soil. Red-Yellow Podzolic Soils

Site 17.09-10

Name. Ray Sida

General Location. In Square 3517 (Figure 3-10) about 4 km west of Ban Wang Yang

Latitude/Longitude. 16° 58' 15" N, 101° 44' 40" E

Description. The size of this open site is unknown. Very tall dense brush, a result of the cultivated area lying fallow for one year, precluded surface collection. A small "cat hole" excavation was placed in the site and indicated a deposit of approximately 20 cm. Stoneware was found in the excavation and a few other pieces were found on the surface. The survey party also searched an area where the landowner said he had found a groundstone adze/axe. One earthenware sherd was found in that area, but there was no indication of a deposit there. This area

may or may not be associated with the site. The landowner also had two stone objects which he found in the nearby stream. They appeared to be part of a stone bangle and the blank from which it was cut, ie. shaped like a donut (fragment) and its "hole."

Environmental Zone. Foothills (Zone 4)

Elevation. 480 m

Geology. Phu Kradung Formation.

Water. A spring, which was said to have been good before the trees were all cut, is located about 100 m south of the site.

Soil. Slope Complex

Site 17.09-11

Name. Tham Pha Khong

General Location. In Square 3317 (Figure 3-6) high up in the northeast side of the limestone outcrop known as Pha Khong, about 5 km southeast of Ban Sam Bang.

Latitude/Longitude. 16° 53' 40" N, 101° 57' 30" E

Description. This site is in a small rockshelter with a sheltered area approximately 10 m long and 5 m maximum depth. A series of paintings executed in red pigment (Figure 3-7) were found about 3 m up on the southern wall of the shelter. It appears that more paintings may have originally been present but, if any, they are now flaked away. No artifacts were found. There is no soil deposit in the shelter and the rock floor has stain rings which suggest that water collects in the shelter in the rainy season.

Environmental Zone. Limestone Highlands (Zone 8)

Elevation. 390 m

Geology. Ratburi Formation

Water. The site is relatively far from known permanent sources but there is evidence that water collects in the site in the wet season.

Soil. Slope Complex

Site 17.09-12

Name. Ray Chaliaw

General Location. In Square 3317 (Figure 3-6) on the eastern outskirts of Ban Huai Som.

Latitude/Longitude. 16° 57' 20" N, 101° 55' 50" E

Description. This is an open site of undetermined size. No mound was visible and the deposit is thought to be shallow. No surface features were encountered. Slag, and stoneware and earthenware sherds were recovered. The earthenware was small sand-tempered plain sherds. The stoneware is indicative of historic occupation.

Environmental Zone. Terracelands (Zone 3). The area of the site, like most of the land around the village, is used for dry crops.

Elevation. 300 m

Geology. Located in a valley between Ratburi Formation and Phu Kradung Formation outcrops.

Water. The site is located along a perennial stream

Soil. Red-brown Earth Soils

Site 17.09-13

Name. Tham Wua Daeng

General Location. In Square 3415 (Figure 3-3) in the limestone outcrop approximately 0.5 km southeast of Wat Tham Maholan.

Latitude/Longitude. 17° 06' 05" N, 101° 53' 05" E

Description. The prominent feature of this site is an extensive array of paintings executed in red pigment on the rock face of the outcrop (Figure 3-4a). The figures occupy an area of approximately 3.5 x 1.5 m on the rock face. A small rockshelter (ca. 2 x 3 m by a maximum 2 m high) is just south of these paintings. It has a shallow deposit which was not excavated. One other rock painting was recorded near this shelter (Figure 3-4b). Seven cordmarked and plain earthenware body sherds were found on the surface of the shelter area. There is also a second cave high up in the rock face but it was inaccessible during the time of this survey. It is believed to be rocky based on information from local informants. The site is apparently prehistoric and the paintings are believed to be associated with ephemeral occupation.

Environmental Zone. Limestone Highlands (Zone 8)

Elevation. 390 m

Geology. Ratburi Formation

Water. This survey did not record any permanent water sources near the site but it is likely that some springs were associated with the limestone.

Soil. Slope Complex

Site 17.09-14

Name. Tham Maholan

General Location. In Square 3415 (Figure 3-3) in the limestone outcrop just east of Wat Tham Maholan. The nearest village is Ban Nong Hin approximately 2 km northwest.

Latitude/Longitude. 17° 06' 20" N, 101° 53' 00" E

Description. Tham Maholan was possibly a significant prehistoric cave site which is now largely destroyed. Informants at the wat told the survey team that a lot of pottery and stone axes were removed from the cave during the construction of the shrine which now occupies most of the cave entrance. All of the artifacts were said to have been removed by the monk who did the work. They also described the removal of a human burial which was subsequently cremated. Only a small fragment of deposit remains along the north wall of the cave entrance. No artifacts were recovered but bone fragments were observed in this deposit. The small rock shelter adjoining the north side of the cave entrance was also possibly a site area but is also disturbed and is now covered with rock fragments.

Environmental Zone. Limestone Highlands (Zone 8)

Elevation. 360 m

Geology. Ratburi Formation

Water. No known perennial sources but springs are likely in limestone area.

Soil. Slope Complex

Site 17.09-15

Name. Tham Yay Sam Bon

General Location. In Square 3315 (Figure 3-2) in Phu Pha Ya approximately 1 km southeast of Ban Phoem.

Latitude/Longitude. 17° 06' 20" N, 101° 55' 50" E

Description. A large rockshelter site with a total sheltered area of 45 x 15 m. Parts of the shelter are rocky and not suitable for occupation. The site is largely intact. There were no visible surface features. The deposit was stony and appeared to be very shallow based on the relationship of soil to rock. No excavations were made. Seventy-three sherds were collected from four discrete areas in the shelter. The sherds were all cordmarked or plain earthenware. Two rim and three body sherds were analyzed in the lab; all were tempered with quartz sand or sand mixed with other mineral grains. All five sherds had incised lines on them. One rim and one body sherd exhibited signs of burnishing. One body sherd had possible red paint applied. Rim forms are discussed in Chapter 5. This pottery appeared to be prehistoric. One stone tool was found in the site. It was a tabular piece of slate which had been chipped and battered on the edges and may have served as a crude cutting tool. A piece of sandstone and a chert cobble, which must have been carried up into the cave, were noted but not recorded as artifacts.

Environmental Zone. Limestone Highlands (Zone 8)

Elevation. 360 m

Geology. Rathburi Formation.

Water. There is a spring below the site.

Soil. Slope Complex

Site 17.09-16

Name. Tham Miang

General Location. In Square 3315 (Figure 3-2) in Phu Pha Ya approximately midway between Ban Phoem and Ban Nong Hai.

Latitude/Longitude. 17° 05' 35" N, 101° 56' 10" E

Description. The five well-lit outer chambers of this cave site were surveyed. Total area of the cave is unknown since the dark areas of the cave were not explored. The site is basically undisturbed and there were no visible surface features. The deposit appeared to be generally very shallow. The deposit was probed where it appeared to be deepest. The probe reached a depth of 28 cm, but no artifacts were found and the only possible evidence of occupation, some bits of charcoal, was found near the surface. Twenty sherds were collected from the surface. The sherds were all cordmarked or plain earthenware. Two rim sherds and a decorated body sherd were analyzed in the lab. The three analyzed sherds were tempered with quartz sand or sand mixed with other mineral grains. Both rims were burnished; their forms are discussed in Chapter 5. The body sherd was burnished and cordmarked, with an incised line separating the two zones. Some shell and bone fragments were found, but no other

artifacts. The pottery appeared to be prehistoric, but prehistoric occupation must have been rather ephemeral.

Environmental Zone. Limestone Highlands (Zone 8)

Elevation. 360 m

Geology. Ratburi Formation

Water. There are no extant springs near the site but it is likely that there were in the past.

Soil. Slope Complex

Site 17.09-18

Name. Ban Kaw (Ban Phoem)

General Location. In Square 3315 (Figure 3-2) on a low mound on the southern outskirts of Ban Phoem.

Latitude/Longitude. 17° 06' 15" N, 101° 55' 25" E

Description. This open site is estimated to be 75 x 50 m and roughly oval. There were no visible surface features. The site has been cultivated but there is little other damage. The deposit did not appear to be deep and is estimated to be less than 1 m. No excavation was made. Surface collection was severely limited due to dense ground cover. Eighty-eight sherds were collected. Four pieces of slag and a bone fragment were also found. The ceramic collection included porcelain, stoneware, and plain earthenware. Eight rim sherds (1 porcelain, 2 stoneware, and 5 earthenware), six decorated stoneware body sherds, and two stoneware base sherds were analyzed in the lab. The porcelain rim and one of the stoneware rims were glazed. The second stoneware rim was plain. The earthenware rims were sand-tempered; three were smooth and two had incised lines. Earthenware rim forms are discussed in Chapter 5. The stoneware base sherds had incised lines. Decoration on the stoneware body sherds included incised line, curvilinear incised design, glaze, applique, and raised modeled line. The pottery appeared to be historic but not recent.

Environmental Zone. Ricelands (Zone 2)

Elevation. 330 m

Geology. Ratburi Formation

Water. A spring existed at the east side of the site before the land was cleared.

Soil. Reddish-Brown Lateritic Soils, adjacent to Low-Humic Gley.

Site 17.09-19

Name. Ray Sombun

General Location. In Square 3315 (Figure 3-2) on the southeastern edge of Ban Nong Hai.

Latitude/Longitude. 17° 04' 25" N, 101° 56' 15" E

Description. This site is apparently the remains of a single smelting furnace approximately 1 m in diameter with a small surrounding scatter of slag. The structure is obliterated and the slag scattered by plowing. A village informant remembered the presence of the remains of a furnace and indicated that the slag had all been in one spot before plowing. No artifacts were associated with the immediate area of the site. The survey team was told that sherds had been dug up in the post holes of the present village but only one plain stoneware body sherd could be located. A large (1.63 kg) chunk of rock with high iron content was given to the project by a villager. It is probably magnetite, a high grade iron ore. This magnetite was buried in the village but its ultimate origin was not known. A collection was made of the slag but neither it nor the magnetite has yet been analyzed. Strictly speaking, the site is not dated. However, it seems reasonable to assume that it is historic and may be associated with an ephemeral earlier occupation of the village area.

Environmental Zone. Terracelands (Zone 3)

Elevation. 300 m

Geology. Ratburi Formation

Water. The site is approximately 100 m from a perennial stream.

Soil. Reddish-Brown Lateritic Soils

Site 17.09-21

Name. Tham Pha Ya

General Location. In Square 3315 (Figure 3-2) in Phu Pha Ya approximately 1 km northeast of Ban Nong Hai.

Latitude/Longitude. 17° 05' 05" N, 101° 56' 30" E

Description. The area of this cave site is 5 x 11 m. There were no surface features. The deposit was very shallow near the entrance and

deeper in the back. The site is virtually undisturbed. Two small probes were excavated in the site. The first was excavated near the center of the deepest soil deposit near the rear of the cave. It went down 40 cm then encountered a layer of loose limestone pieces. Under the limestone was a sterile level of gravel and cave earth to a total depth of 65 cm. Only some fragments of bone and shell were found, but some appeared to have been burnt and one piece of antler appeared to have been polished by use. Thus, there is slight evidence of a cultural deposit. The second probe was excavated near the front entrance and reached a depth of only 10 cm; a few bone fragments were found. Surface finds included seven cordmarked and plain earthenware body sherds which appeared to be prehistoric. Bone and shell fragments were found along with three river cobble fragments and a piece of hematite which must have been carried up into the cave. The site apparently was used ephemerally in prehistoric times.

Environmental Zone. Limestone Highlands (Zone 8). Tobacco was specifically mentioned as the ya (medicine) for which this cave and the limestone outcrop is named.

Elevation. 370 m

Geology. Ratburi Formation

Water. Perennial stream about 1 km west. Seasonal stream at base of outcrop. No springs known by present residents.

Soil. Slope Complex

Site 17.09-22

Name. Stone Monument

General Location. Near the southwest corner of Square 3415 (Figure 3-3). The nearest village is Ban Lao, approximately 1 km NW in Square 3515 (Figure 3-5).

Latitude/Longitude. 17° 04' 45" N, 101° 49' 25" E

Description. The site is the remains of a carved stone monument. The top of the monument was described as originally having seven Naga (mythical serpent) heads carved on it. The top of the monument and some of the base were broken away by villagers who believed that there was something valuable inside. A concrete pad and boundary stones were added in the time of the older inhabitants of the present village. Some of the villagers still come to worship here. No artifacts were found in the immediate area of the site but a groundstone axe fragment, an iron fragment, and a plain earthenware body sherd were found nearby on barren, stony soil. It is possible that there was an associated scatter of material which is now eroded away. The site is undoubtedly historic

but it is unlikely that a precise date could be given since the monument is defaced and not associated with datable material.

Environmental Zone. Terracelands (Zone 3)

Elevation. 330 m

Geology. Phu Kradung Formation.

Water. The local streams are all seasonal. The survey team could obtain no information on water sources before the forests were cut.

Soil. Red-Yellow Podzolic. The soil in the immediate area of the site is a red-yellow sandy soil which is heavily eroded and littered with gravels of various rock including laterite and cherts.

Site 17.09-23

Name. Ban Puan Phu

General Location. In Square 3515 (Figure 3-5) approximately 500 m north of Ban Puan Phu.

Latitude/Longitude. 17° 05' 30" N, 101° 47' 50" E

Description. Ban Puan Phu is an open site on the south end of a low ridge bordering extensive rice fields. A rich collection was made from this site, mainly from an area near the road where a bulldozer had cut into the mound searching for laterite. The site area is roughly estimated at 100 m in diameter, based on surface finds and reports of absence of finds in the wat to the north. A total of 177 sherds were picked up in a grab sample around the site. Another 468 sherds were collected by picking up everything in a 1 x 1 m square where erosion exposed the surface. Of these sherds, 44 rim and 9 decorated body sherds were analyzed in the lab. Most (90%) of these sherds were tempered with quartz sand and the remainder were tempered with sand mixed with other mineral grains. The rims were all plain and all but three were smoothed. Rim forms are similar to excavated rims from this site discussed in Chapter 5. Decoration on the body sherds included incised design, applique, impressed design, smooth banding, and modeled line. Other items found included: five clay pellets, three spindle whorls, three iron artifacts, some bronze and iron detritus, a black and white opaque glass bead, a small blue translucent glass bead, some slag, and bone fragments. The site appeared to be a substantial deposit dating at least back into the prehistoric iron age. This site was selected for excavation (Chapter 4).

Environmental Zone. Terracelands (Zone 3)

Elevation. 330 m

Geology. Valley between Phu Kradung and Ratburi Formations

Water. The perennial stream is now entirely controlled by the paddy system, but must have formerly flowed close to the site.

Soil. Reddish-Brown Lateritic Soils, bordering Hydromorphic Alluvial Soils

Site 17.09-24

Name. Taw Paw Nga

General Location. In Square 3515 (Figure 3-5) approximately 1 km south of Ban Puan Phu.

Latitude/Longitude. 17° 04' 30" N, 101° 47' 40" E

Description. This site is apparently a single smelting furnace which was destroyed by the construction of paddy fields. The informant, Nay Nga, described the site as a mound approximately 3 m in diameter and 2 m high which was leveled about 70 years ago by paddy construction. He led the survey team to the site and some slag was recovered from the paddy fields, confirming the site as the former location of a smelting furnace. The site is not dated, except that it was more than 70 years old, but is likely to have been historic based on the fact that there were standing remains at the time of paddy construction.

Environmental Zone. Ricelands (Zone 2)

Elevation. 330 m

Geology. Valley between Phu Kradung and Ratburi Formations

Water. Specifics are unknown; the present water flow is entirely controlled by the paddy system.

Soil. Hydromorphic Alluvial Soils

Site 17.09-25

Name. Ray Ampha

General Location. In Square 3515 (Figure 3-5) approximately 1 km southeast of Ban Puan Phu.

Latitude/Longitude. 17° 04' 40" N, 101° 48' 25" E

Description. The area and depth of this open site are not known. Due to dense ground cover, collection was restricted to a few locations. The site area does not appear to be a mound and the depth of the deposit was

impossible to estimate. A furnace or hearth was seen at the surface, but there was no associated slag and it was apparently not a smelting furnace. Sixty-two sherds were recovered. Fourteen rims and two body sherds were analyzed in the lab. Fifteen of these sherds was tempered with quartz sand and the remaining sherd was tempered with sand mixed with other mineral grains. All of the rims were plain and all but three were smoothed. Rim forms are discussed in Chapter 5. The body sherds both had appliques and one was also cordmarked. This pottery appears to be prehistoric.

Environmental Zone. Terracelands (Zone 3)

Elevation. 330 m

Geology. Valley between Phu Kradung and Ratburi Formations

Water. There is a tank at the east edge of the site which was reportedly constructed over a spring which no longer flows.

Soil. Reddish-Brown Lateritic Soils

Site 17.09-26

Name. Tham Kway Daeng

General Location. Included in the discussion of Square 3317, although this site is actually just outside the square (Figure 3-6). Site is on the south side of the same outcrop as 17.09-11.

Latitude/Longitude. 16° 53' 35" N, 101° 57' 35" E

Description. This cave has a small soil deposit as well as paintings executed in red pigment. The man (Figure 3-8a) is on the outer east wall, and the buffalo (Figure 3-8b) is high on the ceiling of the shelter. Also present are six red hand prints (both left and right hands) along the back wall, and some other markings. The soil deposit in the main shelter area is approximately 7 m in diameter, but a surface collection yielded little. Some stone which was possibly worked, and part of a stone "donut" were found. The possibly worked stone bears no relation to "typical" Hoabinhian pebble tools. Several sherds were found, but they were almost entirely derived from a rocky passage and small rear chamber which had little or no soil deposits. Three rim sherds and two decorated body sherds were analyzed. All five sherds were tempered with mineral grains; three with sand and two with mixed minerals. Two of the rims were burnished and the third was smooth. Rim forms are discussed in Chapter 5. Both body sherds were cordmarked and incised, and one had burnishing as well. This cave site was subsequently chosen for excavation by the Thai personnel of the NETAP.

Environmental Zone. Limestone Highlands (Zone 8)

Elevation. 350 m

Geology. Ratburi Formation

Water. No data was recorded on nearby water sources.

Soil. Slope complex

Amphoe Chum Phae, Changwat Khon Kaen
(22.01)

Site 22.01-3

Name. Tham Tewada

General Location. In Square 3520 (Figure 3-12) in the karst formation about 1 km south of Ban Khaw Wong.

Latitude/Longitude. 16° 38' 30" N, 101° 46' 45" E

Description. The area of this rockshelter is about 50 x 10 m. Cordmarked and plain sherds were found in two discrete areas in the shelter. One body sherd was analyzed. It was tempered with mixed mineral grains and had an incised design on cordmarking. The site was occupied by a monk at the time of the investigation and modern debris, including Buddhist medallions, were found. Some human bone had been found in a rock niche with incised pottery. The present monk said the bones may have been placed there by the previous monk. The deposit is evidently shallow and had few artifacts.

Environmental Zone. Limestone Highlands (Zone 8)

Elevation. 260 m

Geology. Ratburi Formation

Water. The Lam Choen is at the base of the outcrop

Soil. Slope complex

Site 22.01-4

Name. Non Taw Lek

General Location. In Square 3420 (Figure 3-11) in a satellite village about 1 km northeast of Ban Nong Hao.

Latitude/Longitude. 16° 39' 30" N, 101° 49' 30" E

Description. Informants described the site as a low mound, but this was not discernable under the present ground cover. The site had been cleared about 20 years previously and sherds were said to have been visible on the ground over an area of 10 rai, that is about the size of the present settlement. Ten rai is 16,000 m² or an area about 130 x 130 m. Slag, along with other material, was found in digging up to 1 m deep for house construction, hence the site's name. The survey party recovered pottery only along the recent cut of a logging road along the western side of the site. Six rim sherds were analyzed from the surface collection. All six were tempered with fine sand. Rim forms are discussed in Chapter 5. All six rims had smooth surfaces, and two bore traces of red paint.

Environmental Zone. Terracelands (Zone 3)

Elevation. 250 m

Geology. Ratburi Formation (Alluvial)

Water. The Lam Choen is nearly 1 km south of the site. A nearby pond has water year round. Curiously, the villagers said that they did not build the pond but that the "old" people did.

Soil. Alluvial Soils

Site 22.01-5

Name. Ban Nong Haeo

General Location. In Square 3420 (Figure 3-11) within Ban Nong Haeo.

Latitude/Longitude. 16° 39' 15" N, 101° 49' 15" E

Description. Sherds were found in the area of the headmans house and along the road about 50 m west, and were said to have been found in the area of another house about 100 m east. Two decorated body sherds were analyzed. They were both tempered with prepared clay. One had a stamped design and the second an incised design. Three burnt clay features were found in the yard of the headmans house. One was sectioned; stone and charcoal were the only material recovered. The sectioned feature proved to be similar in design to ovens in current use, eg. to cook pig food. The informants stated that these features were not related to current occupation and the site was recorded, although it appeared to be quite recent.

Environmental Zone. Terracelands (Zone 3)

Elevation. 240 m

Geology. Ratburi Formation (Alluvial)

Water. Available nearby in the Lam Choen

Soil. Alluvial

Site 22.01-7

Name. Ban Song Khon

General Location. In Square 3420 (Figure 3-11) east of the wat in the present village of Ban Song Khon.

Latitude/Longitude. 16° 39' 15" N, 101° 50' 45" E

Description. Stoneware and porcelain were found on the surface, along with some earthenware. A lens of shells, probably fresh water mussels, was seen in the cut of a path down to the river on the south side of the site. A burnt clay feature was observed: it appeared to be similar to the three seen on 22.01-5. Features similar in shape, but much larger than those four features, were observed in this village being used to bake sweets. The distinction of this site from current occupation seems to be dubious.

Environmental Zone. Terracelands (Zone 3)

Elevation. 250 m

Geology. Ratburi Formation (Alluvial)

Water. Available nearby in the Lam Choen.

Soil. Alluvial Soils

Site 22.01-8

Name. Tham Nong Kha

General Location. In Square 3420 (Figure 3-11) in the interior sink of the karst formation about 1 km east of Ban Sakae Khrua.

Latitude/Longitude. 16° 39' 00" N, 101° 52' 45" E

Description. The sheltered area of the cave is approximately 35 x 38 m. The deposit is very shallow and rocky. Cordmarked and plain pottery, bone, and snail shells were recovered from the surface. Four rim sherds were analyzed; all were tempered with fine sand. Two of the rims were burnished, and the other two bore traces of reddish paint. Rim forms are discussed in Chapter 5.

Environmental Zone. Limestone Highlands (Zone 8). The interior sink of this formation is swampy and was said to be a good hunting area.

Elevation. 260 m

Geology. Ratburi Formation

Water. A perennial spring is located below the cave.

Soil. Slope complex

Site 22.01-9

Name. Non Nong Samo

General Location. Not in a formal grid square (see Figure 6-2). This site is approximately 2 km east of Ban Takabu which is in Square 3420 (Figure 3-11).

Latitude/Longitude. 16° 38' 45" N, 101° 55' 30" E

Description. This open site was recorded as two mounds (A and B) both of which rise about 2 m above surrounding paddy land. Mound A is about 70 m in diameter. Mound B is about 100 m in diameter and is located about 150 m northwest of Mound A. Surface collections yielded cordmarked and plain sherds, and a pottery anvil from Mound B. Nine rim sherds (2 from Mound A and 7 from Mound B) were analyzed. All nine were tempered with mineral grains (7 with fine sand, 1 with sand, and 1 with mixed minerals), and all were smooth. Rim forms are discussed in Chapter 5. A local informant described a burial he had uncovered in Area A. It was said to have been found at a depth of 2 m while digging a 2 m diameter circular pit to make charcoal. The upper part of the body was found with "140" beads and covered with sherds. The bones were burned and the beads given away. The informant had retained some teeth fragments, which were identified as human, and some blue glass bead fragments. These lend plausibility to the story. The informant had kept none of the pottery, but said it was like the surface finds from this site.

Environmental Zone. Ricelands (Zone 2)

Elevation. 230 m

Geology. Ratburi Formation

Water. The Nong Samo which was said to be a natural pond is located immediately south of Mound A.

Soil. Red-Yellow Podzolic Soils

Site 22.01-10

Name. Tham Phra of Ban Thakabu

General Location. In Square 3420 (Figure 3-11) in a limestone outcrop about 3 km north of Ban Takabu.

Latitude/Longitude. 16° 39' 45" N, 101° 54' 15" E

Description. There are three chambers in this cave, but artifacts were only found in two. The lower chamber is 6 x 10 m. This chamber had been dug out for construction of a shrine. Evidence indicated that about a meter of deposit had been removed. Some pottery was found in this chamber, but was evidently related to the modern usage. Outside the cave, a few cordmarked body sherds were recovered from the cave earth dumped from inside. The upper chamber is mostly rocky. A small area of soil deposit near the front had been dug away by "treasure hunters." Some Buddhist relics were observed. A variety of sherds were recovered from among the rocks, a situation suggesting ephemeral activities in the cave over a long time. The cave is currently used for hunting bats and collecting bird's nests; this activity is represented by bamboo debris and fire remains. Four stoneware decorated body sherds, four earthenware rim sherds, a decorated earthenware body sherd, and an earthenware base were analyzed from the surface collection. The earthenware was all sand-tempered. The earthenware rims were all burnished and the earthenware body sherd was incised on cordmarking. Earthenware rim forms are discussed in Chapter 5. The earthenware base was smooth, and evidently applied to the vessel.

Environmental Zone. Limestone Highlands (Zone 8)

Elevation. 300 m

Geology. Ratburi Formation

Water. There is a spring lower down on the outcrop, southwest of the site

Soil. Slope Complex

Site 22.01-11

Name. Tham Mup

General Location. In Square 3420 (Figure 3-11) in a limestone outcrop along the road between Ban Thakabu and Ban Sakae Khrua.

Latitude/Longitude. 16° 38' 45" N, 101° 53' 35" E

Description. The main sheltered area of this cave is 24 x 17 m. This site is now occupied by a wat which has virtually destroyed any deposit. No prehistoric artifacts were recovered by the survey party. However, one apparently reliable informant described finding bones and pottery in digging in the deposit to a depth of about 1.5 m, which was not to the bottom of the deposit. Another informant described finding a stone axe

about 20 cm long on the surface before the cave was dug out for the wat. Artifacts were found which apparently relate to the recent use of the cave by a monk. These include a whole pot, a series of pecked river cobbles, and a mortar. Bone and shell were seen in the deposit as well.

Environmental Zone. Limestone Highlands (Zone 8)

Elevation. 260 m

Geology. Ratburi Formation

Water. The stream immediately below the site is seasonal. The Lam Choen is about 200 m south of the site

Soil. Slope Complex

Amphoe Khon San, Changwat Chaiphum
(31.01)

Site 31.01-1

Name. Wat Phosi

General Location. In Square 3420 (Figure 3-11) in the village of Ban Thung Phra

Latitude/Longitude. 16° 39' 15" N, 101° 51' 00" E

Description. The extent of this open site is not clear. There is no visible mound and no surface features. Cordmarked and plain sherds were found around the monks' residence, and at the north and east entrances to the wat. Some sherds were also found in a road cut just north of the wat, and in a small mound, believed to be a construction spoil heap, near the road cut. These finds indicate that the site is at least 50 m in diameter, but total site size is unknown. An informant described finding bones and pottery in digging the old pit toilet in the wat. He described finds to a depth of 3 m, but this appeared likely to be exaggerated. There are superstitions concerning this wat, based on the villagers belief that this was an old burial ground as the result of finding bones when the village was first settled three generations ago. Four rim sherds were analyzed from the surface collection. All were sand-tempered; three were plain smooth surfaced and the fourth had traces of paint. Rim forms are discussed in Chapter 5. A unique white bead of sub-pentangular-pyramid shape was also found. The material of this bead is not known.

Environmental Zone. Terracelands (Zone 3)

Elevation. 240 m

Geology. Ratburi Formation

Water. The perennial Lam Choen is 125 m north of the site

Soil. Gray Podzolic and Red-Yellow Podzolic Soils

Site 31.01-2

Name. Nong Ta Wang

General Location. In Square 3420 (Figure 3-11) about 1 km west of Ban Ta Rong Rom.

Latitude/Longitude. 16° 38' 15" N, 101° 53' 15" E

Description. The area of this open site is only partially known. The west and south side of the site border on paddy fields, and the site appears to rise about 1 m above the paddy on those sides. East and north, the land continues to rise to a low ridge and there is no visible mound, at least under the extant ground cover. Pottery was found in a buffalo wallow on the site, in one other surface location, and along the edges of the paddys. These finds indicate that the site is at least 70 x 50 m, but the total size is unknown. Two rim sherds were analyzed. One was tempered with mineral grains and the second was tempered with prepared clay. Both rims were smooth. Rim forms are discussed in Chapter 5.

Environmental Zone. Terracelands (Zone 3)

Elevation. 240 m

Geology. Ratburi Formation

Water. A spring was formerly present to the west of the site and may be related to the site name. The spring was apparently destroyed by the paddy construction. A spring is also present in the limestone outcrop north of the site. The Lam Choen is about 1 km north of the site.

Soil. Gray Podzolic and Red-Yellow Podzolic Soils

Site 31.01-3

Name. Ban Noy

General Location. In Square 3420 (Figure 3-11) near a small outlying cluster of houses about 1 km east of the main village of Ban Huai Kaeo.

Latitude/Longitude. 16° 39' 15" N, 101° 49' 45" E

Description. This open site is estimated to be about 60 x 30 m, long axis north-south, largely based on descriptions of landowners who had found slag while digging gardens. No artifacts were recovered from the surface. One of the landowners produced some slag and two sherds from a small hole dug in front of his house. The deposit appeared to be shallow, only about 11 cm, at that location. One of the sherds was a smooth rim, tempered with prepared clay. Two large glazed stoneware sherds were also found in a nearby stream bank but are not believed to be associated with the site.

Environmental Zone. Terracelands (Zone 3)

Elevation. 240 m

Geology. Ratburi Formation (Alluvial)

Water. The Lam Choen is only a few meters north of the site.

Soil. Gray Podzolic and Red-Yellow Podzolic Soils

Site 31.01-4

Name. Ray Khaw Yot

General Location. Not in a formal grid square (see Figure 6-2). This site is about 5 km east of Ban Huai Khi Tom which is in Square 3420 (Figure 3-11).

Latitude/Longitude. 16° 38' N, 101° 57' E

Description. The site lies along the Lam Choen. Erosion at the river bank revealed a deposit of about 1.5 m. Cordmarked and plain sherds were found in the exposed deposit which extends about 200 m along the river bank. The extent of the site away from the bank was not known, but was said to be at least 20 m. Six rim and four decorated body sherds were analyzed. All analyzed sherds were tempered with mineral grains (8 with fine sand and 2 with mixed minerals). The rims were all smooth. Rim forms are discussed in Chapter 5. Codable portions of the body were present on two rim sherds; one body was cordmarked and the second had an incised design. Two of the analyzed body sherds had appliques, one an incised design on cordmarking, and the fourth a smooth band on cordmarking. A human skull was also observed in the deposit. A curious groundstone object, three iron bladed tools, and a bronze bracelet attributed to the site were shown to the survey party by local informants. Other bronze bracelets and beads of various colors were also said to have been found in this area.

Environmental Zone. Terracelands (Zone 3)

Elevation. 230 m

Geology. Ratburi Formation

Water. Lam Choen river bank

Soil. Gray Podzolic

Site 31.01-5

Name. Ban Huai Khi Tom

General Location. In Square 3420 (Figure 3-11) in Ban Huai Khi Tom.

Latitude/Longitude. 16° 37' 45" N, 101° 54' 15" E

Description. The area of this open site, according to observations and informants descriptions, is about the size of the present village which is approximately 120 x 300 m. The site is not greatly elevated above the surrounding paddys, about 2 m at the most. Pottery was widespread on the surface, but apparently most surface pottery related to modern occupation. The archaeological deposit was observed in a well on the southwestern side of the village. The deposit at that location was 1.6 m deep (water at 1.75 m) and contained cordmarked and plain pottery. Some other pottery was collected from the paddy dikes constructed along the west side of the site. Nine rim sherds were analyzed. Seven were tempered with mineral grains (5 sand and 2 mixed minerals), and the remaining two with prepared clay. All the rims were smooth; their forms are discussed in Chapter 5.

Environmental Zone. Ricelands (Zone 2)

Elevation. 235 m

Geology. Ratburi Formation

Water. A spring on the west side of the site supplied the villagers with water before the trees were cut; they now rely mainly on wells. The seasonal Huai Khi Tom is on the north side of the site, and the Lam Choen is about 300 m north.

Soils. Brown Forest Soils

Site 31.01-6

Name. Tham Rup

General Location. In Square 3421 (Figure 3-13) in the limestone outcrop about 4.5 km west of Ban Nam Un and about .5 km north of Ban Tham Ngep.

Latitude/Longitude. 16° 35' N, 101 °50' E

Description. This rockshelter site contains a series of paintings in red pigment on the sheltered wall (Figure 3-14). The rockshelter is only approximately 1.5 x 6 m, plus a small low chamber. The figures are on the northwest wall. Also present are two handprints in red pigment on the southeast wall. Preservation of the paintings is poor as the result of water dripping down the wall. The lower central figure was described as a man carrying a bag by an informant who had seen the pictures a long time ago when they were clearer. No artifacts were found at this site.

Environmental Zone. Limestone Highlands (Zone 8)

Elevation. 390 m

Geology. Ratburi Formation

Water. None known in immediate vicinity

Soil. Slope Complex

31.01-7

Name. Tham Ngam Mong Kham

General Location. In Square 3421 (Figure 3-13) in the limestone formation about 5 km west of Ban Nam Un and about .5 km west of Ban Tham Ngep.

Latitude/Longitude. 16° 34' 45" N, 101° 49' 45" E

Description. This rockshelter did not appear to have a good occupation deposit. The shelter is mostly filled with large blocks of limestone. A soil deposit of about 9 x 30 m was present, but it is not level and bore little sign of occupation. One cordmarked sherd was recovered. Three pieces of stone which evidently were brought to the shelter were found. They are a sandstone grinding stone, a river cobble, and a piece of possible hematite. Human bone was found in the area of a pit disturbance in the deposit, but lacking any directly associated artifacts, could be of any age.

Environmental Zone. Limestone Highlands (Zone 8)

Elevation. 320 m

Geology. Ratburi Formation

Water. Water was said to be available a short distance west

Soil. Slope Complex

31.01-8

Name. Tham Mup

General Location. In Square 3421 (Figure 3-13) in a small isolated limestone outcrop about 5 km WSW of Ban Nam Un and about 1 km SSW of Ban Tham Ngep.

Latitude/Longitude. 16° 34' 15" N, 101° 49' 50" E

Description. This small rockshelter site has an overall sheltered area of about 7 x 10 m. Two areas of soil deposit were present. Cordmarked and plain sherds were found on the surface, along with some stoneware. Four earthenware rim sherds were analyzed. Three were tempered with prepared clay and the fourth with mixed mineral grains. All four had smooth rims and two had incised designs on the body portion. Two small "cat hole" excavations were made. One excavation was made in a rocky area near the front of the shelter; the area of concentration of surface sherds. This pit struck rock at a maximum depth of 24 cm. One earthenware body sherd was recovered, and some ash and charcoal were observed. The second pit was excavated in the northern soil deposit. This pit was excavated to 60 cm, the extent of the excavators reach, without striking rock. A complex series of ash and charcoal lenses was recorded. A few small earthenware body sherds were recovered; mainly from levels below 30 cm from the surface. The deposit, while relatively deep, appeared to have few artifacts.

Environmental Zone. Limestone Highlands (Zone 8)

Elevation. 330 m

Geology. Ratburi Formation

Water. The nearest available water is in the stream 300 m north

Soil. Slope Complex

Site 31.01-9

Name. Ray Phun

General Location. In Square 3421 (Figure 3-13) at the southwest corner of the large limestone outcrop locally known as Phu Noy. This location is about 3.5 km west of Ban Nam Un and about 1 km east of Ban Tham Ngep.

Latitude/Longitude. 16° 34' 40" N, 101° 50' 30" E

Description. The area of this open site is not defined. There is no visible mound and most observations were made in a cleared field planted with peppers. Cordmarked and plain sherds were lightly scattered over the field and were numerous in the recently dug, shallow ditch bisecting

the field. Some sherds were found in the bottom of a deep ditch along the west side of the field. However, the survey team was not able to find any sherds in the sides of the deep ditch. Visibility was not good in this area, nor any area surrounding the field. Eighteen rim sherds were analyzed. All were tempered with mineral grains (15 with fine sand and 3 with mixed minerals), and all were plain. Rim forms are discussed in Chapter 5. A spindle whorl fragment and a fragment of groundstone were also found on the surface. The landowner said he had found a skeleton with an iron spear next to the arm.

Environmental Zone. Terracelands (Zone 3)

Elevation. 300 m

Geology. Ratburi Formation

Water. Available in the stream less than 100 m west and south

Soil. Redzinas

Site 31.01-10

Name. Tham Phra of Ban Nam Un

General Location. In Square 3421 (Figure 3-13) in a small isolated outcrop about 1 km southeast of Ban Nam Un.

Latitude/Longitude. 16° 34' 15" N, 101° 52' 45" E

Description. This rockshelter is currently occupied by a wat. The sheltered area is about 11 x 12 m. Stoneware and plain earthenware was found on the surface. Bone and charcoal, but no artifacts, were found in a small "cat hole" excavation at the edge of the wat building.

Environmental Zone. Limestone Highlands (Zone 8)

Elevation. 280 m

Geology. Ratburi Formation

Water. Available from nearby springs which are now used to irrigate rice fields.

Soil. Slope Complex

Site 31.01-11

Name. Non Khaw Wong

General Location. In Square 3520 (Figure 3-12) about 500 m southwest across the Lam Choen from Ban Khaw Wong, Amphoe Chum Phae, Changwat Khon Kaen. The Lam Choen is a changwat boundary, and the site area is technically within the jurisdiction of Ban Huai Kaeo, Amphoe Khon San, Changwat Chaiyaphum, but that village is about 5 km to the east.

Latitude/Longitude. 16° 38' 45" N, 101° 46' 45" E

Description. The site was described as a mound (non) by villagers. Subsequently, it was determined that the site location was an old river terrace and the lower land between the site and the present river is probably a series of old river channels. The site name was not altered. The site area is not known; all the recovered artifacts were found in eroded areas along the northeast side of the site, where a steep bank is present. Surface finds included cordmarked and plain sherds. Seventeen rim sherds were analyzed. All were tempered with mineral grains (14 with sand and 3 with mixed minerals). Sixteen of the rims were smooth and plain, and one bore reddish paint traces. Rim forms are similar to the excavated rims from this site discussed in Chapter 5. Two groundstone adze/axes said to have been found at this site were recorded. One was shouldered, similar in form to Duff (1970) Type 8, and one had a simple rectangular form, similar to Duff (1970) Type 2. An iron axe, probably not very old, was also recorded. This site was selected for a test excavation (Chapter 4).

Environmental Zone. Terracelands (Zone 3)

Elevation. 260 m

Geology. Ratburi Formation

Water. The Lam Choen is about 500 m north of the site at present, but appears to have flowed past the site in the past.

Soil. Grey Podzolic Soils

Site 31.01-12

Name. Tham Lay

General Location. In Square 3520 (Figure 3-12) about 1 km southwest of Ban Khaw Wong. As with 31.01-11, this area is technically in Ban Huai Kaeo.

Latitude/Longitude. 16° 38' 30" N, 101° 46' 30" E

Description. This cave shelters an area about 6 x 6 m. The deposit is shallow and rocky. Cordmarked and plain body sherds were recovered from the surface, and from a hole, about 30 cm deep, dug by the landowner in the back of the cave. Large numbers of snail shells were seen, but may be natural. The landowner (Nay Lay) first came here to investigate a

mysterious light which flew out of the cave. A monk once lived here for a short time because of the light. Some bamboo debris is attributable to that time.

Environmental Zone. Limestone Highlands (Zone 8)

Elevation. 280 m

Geology. Ratburi Formation

Water. There was a spring below the cave before the trees were cut.

Soil. Slope Complex

Amphoe Kaset Sombun, Changwat Chaiyaphum
(31.03)

Site 31.03-1

Name. Ban Nong Hai

General Location. In Square 3423 (Figure 3-15) in the village of Ban Nong Hai.

Latitude/Longitude. 16° 21' 50" N, 101° 49' 10" E

Description. This open site is a low mound approximately the same size as the present village, about 280 x 240 m. The mound rises to a maximum of about 3 m above the surrounding fields. The field party collected cordmarked and plain sherds from an erosion area at the road slope on the northwest side of the site. A fragment of a groundstone adze/axe was also found in this area. Another groundstone adze/axe was said to have been found in this area but was not kept by the finder. The survey party was also given sherds found by villagers in various parts of the village; the headman said that every household had found pottery in digging post holes for their houses. Seventeen rim sherds were analyzed. All were tempered with mineral grains (12 with fine sand, 3 with sand, and 2 with mixed minerals). Sixteen were smooth plain finish and one bore paint traces. Rim forms are discussed in Chapter 5.

Environmental Zone. Ricelands (Zone 2)

Elevation. 240 m

Geology. Phu Kradung Formation (Alluvial)

Water. The Huai Prom is near the east border of the village

Soil. Alluvial Complex

Site 31.03-2

Name. Ray Kham

General Location. In Square 3423 (Figure 3-15) in newly constructed paddys about 3 km northwest of Ban Phik Laeng. The location of this site is only generally accurate.

Latitude/Longitude. 16° 26' 30" N, 101° 50' 15" E

Description. This site consisted of a burnt clay feature and a scatter of slag, possible tuyere fragments, and a possible brick fragment in a area less than 5 m in diameter. It is apparently the remains of an iron smelting furnace.

Environmental Zone. Terracelands (Zone 3)

Elevation. 280 m

Geology. Phu Kradung Formation

Water. A seasonal stream is about 20 m east of the site, but no perennial sources are known nearby.

Soil. Red-Yellow Podzolic Soils

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