Chapter 2

A review of previous studies

2.1 Introduction

Former studies of prehistoric Southeast Asian ceramics share many of the inadequacies displayed by ceramic research undertaken elsewhere and upon which much prehistoric research in Southeast Asia has been based. With very rare exceptions most of these studies are concerned with aspects of pottery style. Such stylistic perspectives suffer from shortcomings inherent in the researcher's perception when assessing physical phenomena. These influences affect all analyses which emphasize an artefact's superficial physical appearance. In addition, they may be biased by the researcher's natural subjectivity. Ceramic artefacts are affected by a wide variety of many physical and sociological factors. Their inter-relationships are embodied in pottery. These parameters will be discussed prior to reviewing earlier studies in order to demonstrate the need for more detailed information.

Of all artefacts available to archaeologists, pottery has probably suffered most from subjective classification. Shepard (1971:98), discussed the nature of this problem, which she termed "pottery sense". She defined it as the "process of organisation of impressions". Tension between objective methods and pottery sense underlies many of the inadequacies in ceramic analysis. Thus, despite rigorous efforts to be objective, attention may unconsciously be drawn to qualities defined by the immediate interests. Emphasis on readily identifiable variables, made at the expense of others, may lead to distortions in perception which amount to a process of selection by omission.

Ceramics share with lithic artefacts a high degree of durability and this has given both considerable prominence in classification studies. In practical terms, potting clays possess potential to be fashioned into an almost infinite variety of forms. By contrast, durable lithic artefacts can often only be fashioned into a limited range of forms, without an input of high levels of energy and/or technology. These limitations reflect constraints imposed by physical forces which act to shape durable rocks (Flint and Skinner 1977). Thus dependent upon the prehistoric material under consideration, two possible parameters appear inevitable:

1. A finite range of (known, or unknown but potentially determinable) forms will exist.
2. An apparently infinite variety of forms exist.

Even with hand-crafted methods, an almost infinite variety of pottery forms are possible. In order to demonstrate this, it is necessary to consider the variables which influence pottery form.

We commence with the need to distinguish between two major parameters, those imposed by technical and those affected by socio-cultural factors. In the latter group are temporal, areal,

material, stylistic and functional constraints. Each of these is, to a varying degree, interrelated and interdependent. Temporal and areal distributions are both critically influenced by scale. For example, it would be misleading to assert that comparisons of rimforms between two cultures separated temporally was *necessarily* meaningful without corroborative evidence. The degree to which the cultures where temporally separated, however, affects the weight likely to be afforded any such corroborative evidence. Areal distribution is similarly affected by scale. No matter how distinctive, a rimsherd demonstrably typical of, for example, British Beaker Ware, and recovered in archaeological contexts from, say, Romano-British strata, will not be classified as anything more than a stratigraphically "mobile" artefact. It requires more than morphological association to order artefacts into a temporo-areal focus.

The range of forms possible is determined by the available materials in combination with the degree of technological complexity at the disposal of the potters concerned. Both are interrelated. Within these constraints, style is allowed complete freedom. That is to say, the only physical limitations to stylistic creation are those imposed by material and technological factors. Potting clay is the plastic material par excellence. Note, for example, the complexity of forms reported from burial contexts in Peru (Donnan and Mackey,1978:*passim*).

Functional constraints place form analysis on much firmer ground, because here a degree of morphological uniformity may be imposed on forms intended for like end uses. Intended functions dictate the range of forms appropriate to them. Water containers for example, must be capable of efficiently containing liquid. In spite of this constraint, however, only a brief glance at a range of forms associated with any given function will demonstrate the magnitude of problems faced in function-orientated form studies. Compare, for example, cooking vessels of contemporary Northeast Thailand (often functionally connected by analogy to prehistoric examples (MacDonald 1980)), with those of the Romano-British "Dales" ware (Peacock 1982:87). Form analysis would correctly separate these vessels into two entirely different classes. This is because the significance of their forms relates to different *cultural* approaches to the same problem. Yet they were almost certainly designed for, and served, similar functions as cooking vessels.

The success of functional-form classification, however, is not sustainable in all cross-cultural comparisons. For example, a comparison can be drawn between Roman amphorae and vessels from archaeological contexts at Pan Po, China (Watson 1961:43, Rawson 1980:189). Although a close examination would reveal minor but diagnostic form differences, such as handle position and base shape, the close similarity between these two forms is striking. It gives rise to immense theoretical problems. Are we dealing with diffusion, invasion, parallel development, or some extremely rare coincidence? In practice such anomolies are not afforded theoretical moment without supportive or corroborative evidence.

We require additional evidence to support the isolated data provided by an artefact's form. This may be either qualitative or quantitative. In the first instance such factors as archaeological provenance or temporal context will be questioned. The provenance of artefacts considered to be temporal mis-fits will be considered suspect. Conversely, doubtful provenance will seriously weaken any anomolous artefact's temporal association. By definition, metallic artefacts do not belong in the Mesolithic any more than plastic belongs in the Bronze Age.

The presence of occasional "rogue" artefacts is predictable given the vagaries of post-depositional disturbances. Artefacts uncovered from even reasonably secure stratigraphic contexts, *in quantity*, are usually justifiably associated with the temporal,if not the areal, contexts they appear to represent. Rogues occur only occasionally. Authentic representatives of the

culture under study can be expected in relative abundance. Each succeeding example of a distinctive form further reinforces both its association with the culture it is held to represent, and that culture's association with the form. This mutually reinforcing process is the essence of scientific induction. Unpredicted results cannot be accepted without further tests that confirm the initial result.In a sense this is a deductive solution to an inductive problem. By associating like forms with like, form classification proceeds in an inductive manner until some anomaly occurs. The corpus of inductively derived data is then used to test the unpredicted "rogue" against the established form class.

Such arguments are invalid. They take the following invalid logical form of deduction :

1. Many artefacts from site "*X*" are of this form.
2. This artefact is the same form.

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3. This artefact belongs to site "*X*".

The conclusion does not follow of necessity from 1. and 2. Even if 1. and 2. are true it may transpire that the artefact in question is one that was made elsewhere, either as a copy of the major form class at site "*X*", or as a prototype for a site "*X*" major form class. Alternatively it may represent an instance of independent, parallel development.

2.2 Theoretical aspects

Insight into several basic concepts used in previous studies will be aided by a consideration of some theoretical approaches which appear to lie at the core of style analysis.

Clarke (1968, 1978), viewed most archaeological entities as being comprised of groups of entities of lower taxonomic rank. "Culture groups are clusters of cultures, cultures are clusters of assemblages, assemblages are clusters of types, types are clusters of artefacts and artefacts are clusters of attributes or traits" (Clarke 1978:35). The traditional 'sensible' grouping of objects according to prejudged unique sets of attributes that are both sufficient and necessary for group membership, is described as monothetic. Clarke argues that while monothetic groupings are common practice they are illusory, as archaeological taxonomic groups never contain individuals with identical attributes. Thus such groupings are polythetic not monothetic. That is "a group of entities such that each entity possesses a large number of the attributes of the group, each attribute is shared by large numbers of entities and no single attribute is both sufficient and necessary to the group membership" (Clarke 1978:36). Thus, in Clarke's model, the uniqueness of the monothetic group form is not practically apparent in archaeological assemblages. What we are dealing with are polythetic groups.

Clearly the key factor in either of these groups is an unequivocal definition of what is an archaeological attribute. Clarke (1978:156), promotes an "approximate" definition: " - a logically irreducible character of two or more states, acting as an independent variable within a specific frame of reference". To Clarke, attributes are restricted to "fossil behavioural elements of the level of single kind of actions, or micro-sequences of actions" (1978:154). Attributes result from and are equivalent to, "premeditated and deliberate hominid behaviour" (Clarke 1978:156).

The genesis of Clarke's behavioural approach may lie in his work on pottery style, particularly with European Beaker Ware (1962, 1967, 1970). He paid close attention to incised design elements on beakers. Designs, and design field groups, were treated statistically to generate class clusters. These were held to indicate an individual vessel's attribute group relationship. Such attribute-derived style groups were considered culturally significant by Clarke (1970:1-8, 1978:156-158, 210-214, 252, 277).

The above definition of attribute is either explicit or implicit in many analyses of pottery style. Unfortunately it leads to most of the inadequacies imbedded in the method.

Clarke equates attributes with human behaviour and extends this to cultures, cultural groups, and larger archaeological groupings termed "technocomplexes" (1978:328). Technocomplexes are culture groups related through possessed artefact/attribute affinities. Such inductive reasoning views these affinities as ordered and regulated phenomena obeying scientifically testable "laws" of human behaviour. But they share a lack of predictive rigour displayed by sociological studies generally (Popper 1967). This gives rise to two major difficulties. First, at what scale are attributes representative of any particular cultural entity? Second, how are non-sociological data to be treated when they contradict Clarke's essentially sociological approach?

Although attributes are demonstrably valuable delineaters of large-scale technocomplexes (Clarke 1978:328-362), their validity in characterising smaller scale cultural groups is questionable. Particularly when they are used to define cultural subdivisions areally and/or temporally. Unfortunately, ceramic attributes have been extensively employed in this manner in North America (McKern 1939, Phillips *et al.* 1951), and in many previous Southeast Asian studies.

According to Arnold (1985), most interpretations of Central Andean archaeology rest on ceramic style distributions assumed to reflect regional culture history. But recent work suggests that these distributions give "a distorted picture of Central Andean prehistory" (Arnold 1985:94-95). This is because production was centred in relatively few locations where full-time potters engaged in year-round production. The location of these centres was determined by climatic and resource restrictions. They were facilitated, and positively reinforced, by the existence of large-scale pottery trade and exchange involving long distances. These Andean ceramic distributions reflect, not culture histories *sensu stricto*, but changing patterns of trade and exchange. This is an instance where questions of scale and non-sociological factors, as well as sociological, are involved.

The above discussion is not intended to suggest that style analysis has no place in studies of archaeological ceramics. It is included, however, in an effort to show that such studies, *in the absence of non-stylistic corroborative evidence*, are weakened by that omission.

2.3 Review of earlier Southeast Asian studies

Southeast Asian pottery studies over the past five decades share an approach often evident in both Europe and North America. This has been characterised by ontology giving way to taxonomy. Nomenclature often implied functionally oriented derivations for artefact forms. Design elements were designated to varieties or styles. Combinations of shape, design type and location on a vessel, equated with style. Before recent advances, discrete entities, such as European "Beaker Ware" (Clarke 1970, Harrison 1980), were held to denote corresponding cultural entities. With a few notable exceptions, technical analysis was ignored.

The traditional "Euro-American" approach characterises the study of Southeast Asian pottery from the early work of Quaritch-Wales to the present. Thus a stratum at Muang Phet

which revealed apparently distinctive potsherds was equated with a movement of Dvārvatī people from the Lower Chao Phraya area by Quaritch-Wales (1957). Sørensen (1972) based his analysis of the Ban Kao funerary ware on shape, surface treatment and colour. Functional inferences are reflected in his system of nomenclature. Some of the Ban Kao vessel shapes led him to draw direct parallels with Lungshangoid pottery and to postulate an overland migration route from China. The same underlying concept, that cultural relationships are clearly discernible in pottery styles, marks the criticisms of Sørensen's work by Parker (1968). Bayard (1970) considered the Ban Kao pottery types to have reasonably close parallels with the middle period at Non Nok Tha. One vessel form, labelled "fruitstands", he considered distinctive enough to be diagnostic. Rather than Lungshanoid, however, Bayard found closer relationships between Ban Kao and Non Nok Tha, Lopburi and Khok Charoen.

In many ways, Bayard's approach to the rich Non Nok Tha data has influenced most subsequent studies, therefore his analytical treatments will be covered in some detail. His first impressions of the overall pottery assemblage were that a majority comprised sand-tempered, cordmarked, open-fired earthen-ware. Other types of temper and finish, such as plain or smoothed sherds tempered with rice or ground clay were considered minor categories, "very probably from imported vessels.." (Bayard 1976:146). Subsequent qualitative examination of sherds and whole vessels, however, revealed a "reasonable variety" of different tempers, forms and surface decoration. In view of these apparent variations, computer analysis, following a hierarchic taxonomy, was used. Variables included size, form, temper, surface finish, rim shape, surface treatment of rims, rim lip diameter and many metrical variables including size dimensions, sherd quantities and weights. Apart from the metrical variables, all the data were subjectively derived and heavily biased towards form and decoration.

Bayard considered funerary pottery to be of prime importance among the artefact classes recovered. He viewed vessel style and method of interment as relatively precise provenance indicators for disturbed burials. Vessel typology was used as an independent check on the phase designations of burials.

Temper is one of Bayard's variables but it was not prominent in his classification scheme. The method of determining temper in burial vessels is not described, but non-burial sherds were examined with a low-powered binocular microscope. Eleven temper types were recognised: Sand 60.0%, sand and chaff 15.3%, fine chaff and sand 8.2%, chaff 6.2%, prepared temper 3.5%, chaff and laterite 1.7%, laterite and sand 1.7%, sand and red pigment 1.0%, crumbly sand 1.0%, laterite 1.0%, and no temper, 0.1%. Variations in temper type are listed according to chronological periods set out as generalised periods, but not specific stratigraphic units (Bayard 1977:76). This typological scheme is conceded to be arbitrary and somewhat impressionistic (Bayard 1977:65). But in a later study, which employed the same basic variables applied to a larger sample (847 vessels against less than 100), it is seen to provide a satisfactory degree of rigour (Bayard 1984:117).

Bayard (in press), has subsequently asserted that temper was included in the Non Nok Tha vessel typology. It is important to clarify whether temper was included as a variable in Bayard's classification, because at Non Nok Tha the most comprehensive assemblage of Southeast Asian mortuary vessels was uncovered. According to Bayard (1984:90), the "final typology" is "based on reconstruction, full measurement, and computer analysis of some 847 vessels, and achieves a quite satisfactory standard of rigour." His classification scheme involved three steps. Vessels were first grouped into six classes based on shape and base form. "Stylistic variants or types were then distinguished for each class, based on non-metrical differences in surface treatment, decoration, shape, and rim form ..". The third step involved

merging of some of these "types" to produce 38 "types" within the six classes. This accounted for 799 (94%) of the total sample. The remaining vessels being "27 unique specimens and 21 Class 1 vessels lacking the basal portion". Some of the stylistic variants or "types", were considered to differ only slightly in shape or proportion. Two vessels, however, "represented actual blends of two types, and only one fell in between two of the six morphological classes". These were thus considered unique. Factor analysis, using "the mean dimensions of each type," and "based on 10 metrical variables only" confirmed the morphologically-based initial classifications (Bayard 1984:90).

None of the above steps specifically includes temper as a determinate. Although temper is listed as a "ceramic variable" (Bayard 1984:117), it is not used to differentiate either "types" or "classes". Thus in Bayard's final (1984) scheme both "classes" and "types" are presented as morphological entities. Predictably, factor analysis employing the same metrical variables used in the initial six-class classification scheme produced a clear grouping of vessels into the classes originally created for them through selecting the identical metrical factors. The utility of such predictions may be questionable because of their circular nature (Orton 1980:138-139).

Although temper appears to have been omitted from Bayard's classification *calculations*, it is included with a list of non-metrical variables as comparable to fabric (1984:117). Temper and fabric are here defined as two different entities. Temper is an additive deliberately mixed into plastic potting clays in order to improve their usefulness for ceramic purposes. Fabrics may be tempered or untempered. This is because some potting clays can be used without the addition of temper. Bayard groups temper with form variables (1984:117). Again, this concept is different to the definition of a pottery type used here. This is important and we will return to it later.

The only published temper/vessel association available for the Non Nok Tha funerary vessels is "an interim typology" (Bayard 1977:65-79), later termed an "interim classification" (Bayard in press). Isolated references of a general nature apart, such as "pottery tempered with chaff" (Bayard 1971:22), in the absence of any subsequent detailed temper-inclusive typology we must presume that the 1977 temper/vessel associations were also used in the "final classification" (Bayard 1984). A more complete typology is intended, however: "Temper types of the funerary vessels themselves will be published when full formal decorative analysis have been completed" (Bayard 1977:99). These treatments involve temper as it relates to the various funerary vessel "types" (Bayard 1977:65-72), although the original "types" are later termed "classes" (Bayard 1984:91). Bayard's 1977 publication clearly sets out six funerary vessel "types" "distinguished primarily by shape"..... "Within these six types a number of subtypes have been established on the basis of decoration and size (figure 4)" (Bayard 1977:65).

Type one is subdivided into six subtypes three of which (1A,1B, and 1C) are sand tempered. No temper details are given for subtypes 1D or 1F, but most of the 1E subtypes are tempered with "crushed rice chaff and some sand.." (Bayard 1977:69). Type two is subdivided into four subtypes. Subtype 11A is sand tempered; 11B is tempered with coarsely ground clay which is "lightly tempered with rice chaff;.." For subtype 11C the "temper is uniformly of silicified rice chaff and a small amount of sand". 11D is tempered with sand, and in addition "the brilliant red colour of the clay body, ... makes it seem likely that some form of red pigment was added to the clay". Type three contains only three vessels all of which are sand tempered. Type four is subdivided into four subtypes. 1VA and 1VB are listed as sand-tempered. 1VC, however, is tempered with silicified rice chaff. 1VD are simply smaller versions of the 1VC subtypes. Type five has two subtypes, both sand tempered. As with the 11D vessels, the VB subtypes, however, appeared to have had red pigment as well as sand mixed with the clay.

Type six is subdivided into two subtypes and both are sand tempered (Bayard 1977:72). In an earlier typology (Bayard 1971:43-44), the same morphological scheme as that set out above was employed, but temper is not mentioned.

"Class" and "type" are used in the final (1984) typology in place of "type" and "subtype" in the earlier (1977) "interim typology". These substitutions refer to form criteria and are thus of no consequence to the temper/vessel associations. Perhaps significantly, "class" has often been used as a loose "mentalist" synonym denoting a widespread occurrence of style-defined pottery types (Gifford 1960, Deetz 1967). Apart from type 1D and 1E, which feature an appliqué band and nubbins respectively in the 1977 typology, the remaining 1984 types are the same as those previously labelled "subtypes" (1977), or "types" (1971:43). In each step, from "types" to "subtypes", to "classes" comprising "types", Bayard's classifications have been morphological. Temper is never explicitly a criterion. Hence we need only consider the more detailed earlier (1977) publication.

Clearly the 1977 types are not subdivided into subtypes on the basis of temper. Some subtypes contain the same temper and others are not given temper categories. Indeed Bayard (1977) clearly stated that the subtypes were established on the basis of decoration and size. A detailed evaluation of Non Nok Tha fabrics could prove worthwhile, as much of the stratigraphical integrity rests on the correlations considered to be represented by the funerary vessel typology (Bayard 1977:63, 65, and 79). Further, discrete, socially stratified, groups may be identified by the presence or absence of different vessel "types" (Bayard 1984:109–116). Petrographic data could help test this hypothesis, and fabric and form associations could allow an alternative approach to the evidence. One possibility is that changes in temper species at Non Nok Tha are correlated with cultural changes. Much of the present taxonomic confusion seems to stem from a lack of general agreement regarding the definition of what constitutes a ceramic type. This difficulty may be rectified by employing the kind of approach recommended by Hulthen, and touched on below.

Concensus regarding what defines a ceramic "type", has been reached recently in Europe (Hulthen 1974:7). This has allowed a unified methodological and theoretical approach. Yet concensus and clarification were absent less than two decades ago (Peacock 1970:380-389). A similar concept, however, had already been applied to Sudanese pottery (Adams 1964). European concensus has resulted in rewarding advances in ceramic investigations (Hulthen 1977, Howard and Morris 1981, Freestone *et.al* 1982), undertaken within this prescriptive scientific "paradigm" (Kuhn 1962,1963). Unfortunately the European experience has not been matched in North or Meso-America. The "mentalist" approach (Arnold 1985:4–12), with its style oriented emphasis, has continued to dominate research in the Americas in spite of attempts to inculcate the kind of technological methods espoused by Shepard and others (e.g. Porter 1964, 1965). An absence of such concensus in Southeast Asia makes the urgent need for the adoption of a standardised terminology, that is both precise and appropriate, seem obvious.

Bayard's methods closely follow those of many American practitioners. These generally either omit or emphasise superficial technological aspects of ceramic fabrics. Typically, technological "attributes" are encompassed in an all-embracing category labelled "general technology" which, together with surface treatment and vessel form (or "design style"), comprise "a class of pottery" (cf.Wheat *et.al* 1958:34-46). A consideration of these important questions is set out in chapter three.

Insight into the selection of methods used in Bayard's detailed stylistic analysis is increased through a consideration of Buchan's research on assemblages derived from Higham and Parker's excavations at Non Nong Chik. Working under Bayard's supervision, she devoted

considerable attention to the definition of the type. She followed Ehrich (1950), and Spaulding (1960) in noting that a "type (is) defined as a group of artefacts consistantly displaying a specific combination of attributes sufficient to produce a characteristic form" (Buchan 1973:15).

Defining and selecting appropriate attributes is clearly crucial. Buchan emphasised the variety of possible attributes in pottery samples, a direct result of the plastic nature of clay. The end result is a greater variety of component attributes versus a lesser degree of necessary interdependence between them. This means that a specific attribute combination may not always occur. The type-variety system of classification with its emphasis on ceramic type clusters is most similar to the hierarchical system chosen by Buchan, employing as it does 38 pottery variables incorporated in Bayard's computer format. One particular variable, temper, contained 39 sub-categories derived from various combinations of four basic temper types: sand, rice chaff, laterite and prepared temper (either ground potsherds or crushed pre-fired clay balls).

It is notable that, following a detailed statistical analysis, only one pair of variables could be used for χ^2 tests of association: temper types and body decoration. A definite association between the two variables was evident in the majority of results. Thus, although attributes concerned with artefact form comprise the major portion of the statistical formula, the single fabric-related attribute was equally influential statistically.

Clarke (1962, 1970), concerned with recognizing attribute groupings in his beaker ware studies, was lead by his sociological approach essentially to ignore material aspects of the pottery. Thus, Buchan includes both material and non-material attributes while Clarke does not. Yet both are interested in providing a descriptive "type" conceived as a morphological entity. Significantly, although Buchan's attributes are clearly biased towards non-material factors, the one material attribute considered was prominent in the statistically generated results. Such studies typify the morphological and decoration emphasis that characterise style oriented research.

Faced with a pottery assemblage of *c*.200,000 bodysherds and 50,000 rims, Bronson (1976), considered mathematical attribute analysis too time consuming because of the huge sample size and excessive amount of apparently significant attributes. Random sampling was rejected due to the risk of ignoring unique or rare sherd types, which are potentially important if they are imported. Further, while a particular design or form attribute may have a limited temporal and spatial distribution, and is thus potentially important for documenting contact between social groups, most mathematical taxonomic systems, according to Bronson, are unable to provide appropriate weighting emphasis.

Chronology is central to Bronson's methodology. Yet the existing system of nomenclature for the protohistoric and historic periods in the Chansen area was based on art styles and Kingdoms, such as the Funan, Dvāravatī, Khmer and Sukhothai. In consequence, in Bronson's and Dale's own words, "such basic procedures as pottery classification had to be started from scratch" (Bronson and Dales 1972:18). Not only did Southeast Asia lack an established system of description and classification, the Chansen material was considered not to be amenable to systems favoured elsewhere. An innovative system was therefore devised, which used terms and categories, such as "sorting class", "specials" and "variants". While the terminology is familiar, definitions display adaptive flexibility suited to the kind and quantity (*c* 66% of the sherds recovered) of the pottery analysed.

Central to the "reasonably objective" system employed is again the concept of type. Bronson's types comprise rimsherds with at least one shared distinctive attribute. Attributes are "any single descriptive characteristic", and a characteristic in turn "cannot be subdivided further without detailed technical examination". Attributes, the elementary taxonomic units, are

variously combined to produce modes, types, specials, sorting classes, variants, type complexes and fabric groups.

Bronson's treatment of the data is detailed and comprehensive within the framework outlined above. Attributes of a technical nature, such as colour, surface finish and temper appear subjectively derived, however, and form nomenclature reflects functional assumptions. Form classes are based mainly on shape and size criteria. They are limited to common whole-vessel taxa, and feature a form plus specific attribute formula definition. They also invariably include either a fabric group or temper type as an attribute. Ultimately, the ceramic phases derived from the above studies are seen to mirror cultural episodes, where long, stable periods are separated by shorter, accelerated periods of transition.

White (1986), uses a ceramic "typology", in association with stratigraphic and radiocarbon data, with the intention of defining a relative and absolute chronology for Ban Chiang burials. She then attempts to cross-date this chronology with sequences from other sites. The relative chronology of Ban Chiang "..the 'type site' for the northern Khorat Plateau.." is principally based on "a detailed examination of burial ceramics and their sequential relationships" (White 1986:134). According to White, prior "..dating of the Ban Chiang sequence has been a major controversy.." (1986:133).

Again this study concentrates on style. White postpones the construction of a "formal typology" in favour of a "provisional typology" (or "*pt*"). She argues that postponement is necessary because of difficulty in relating marked ceramic variation to the chronology, a lack of statistical data, "and particularly insufficient information on fabric" (White 1986:82). Thus "Types" with a capital "T" are considered to require the inclusion of technological analysis, whereas a "*pt*" is an artefact group whose members share a trait "cluster". This relationship allows them to be distinguished from another group. Because the "*pt*" concept is specifically related to defining chronology, definitive "pt" criteria may vary (White 1986:83). Vessel morphology and size are often considered "key" definitive "traits". Alternatively, surface treatments alone are sometimes held to be distinctive and common enough. Hence, in these cases, different vessel shapes "would unnecessarily encumber" the discussion. As morphology is not deemed to be consistently "relevant to the definition of every *pt*, the term 'Form' ...was rejected" (White 1986:83-84). Generalized size categories (small, medium and large) and functionally implicit descriptions (bowls, jars, or round bottomed pots), are combined with technological data (colour, surface decoration, construction method and fabric details), where available.

This "temporary scheme" allowed 18 *pt's* to be related to 19 chronological sequences (White 1986:82-84). Thus according to White the 341 excavated Ban Chiang vessels (Hastings 1982:38-39), can conveniently be represented by 18 *pt's*. Perhaps significantly 10 of the 18 *pt's* include vessels for which technological data were available. These technological studies are discussed below.

White's attributes are selected subjectively "based on extensive experience with the collection" (1986:82). Phrases such as "intuitively of immediate chronological use" (1986:81), or "The sequence proposed here makes more 'stylistic sense' ", (1986:113-114), reflect a substantial reliance on a subjective "pottery sense", and underline the overall approach used. Her "*pt*" definition, which is intended to relate distinctive artefacts with discrete archaeological units, echoes Clarke's discussed above. It typifies the stylistic "paradigm".

Severe constraints were imposed on White by the limited technological information available. Comparison of Ban Na Di vessel forms with Ban Chiang "*pt's*" helped lead White to conclude that, in spite of a paucity of excavated data, Northeast Thailand can be characterised

by its marked regional ceramic variability. At Ban Na Di, however, imported ceramics clearly denote external relationships. These apparently conflicting factors are thus considered irreconcilable with cultural homogeneity. Opposition between these two cultural aspects is thus seen to reflect "not isolation but more subtle socio-cultural processes" (1986:220). Paradoxically, however, according to White, intersite assymetry in imported items disqualifies any single category as sufficient for cross-dating between sites (1986:221).

White's use of the Ban Chiang ceramic assemblage turns on a "provisional" ceramic typology. This is promoted as a style-only typological classification. Unfortunately it is often unclear as to which definition of "type" White is referring. The limitations of ceramic styles for cross-cultural comparisons are freely admitted (White 1986:233). Hence the utility of this kind of study for assessments of cultural developments in the region is determined by the approach employed.

It is possible that the various groups of associated *pt's*, and/or the *pt's* themselves, may reflect any of a wide range of cultural events, either singly or in combination. For example, as with Arnold's Andean case, these changes may reflect a change in the source of imported ceramics. Alternatively they may represent a change in local fashion preferences (cf. Watson *et al.* 1982). As a first step towards resolving these problems, it would seem prudent to establish whether the ceramics were the product of a local industry or, if not, to what degree they represent imported goods. White (1982:82) lists ceramic anvils, accoutrements of pottery manufacture, from both Late and Middle Periods at Ban Chiang, and hints that they may relate to a local industry. Unfortunately no further assessment of their status has been published to date.

2.4 Technological studies

Petrographic analysis of sherds from Khok Charoen using standard thin-section polarized light, as well as electron microprobe chemical determination techniques, has identified six fabric groups (Watson *et al.* 1982). This important study highlights the need for fine-grained analysis of prehistoric ceramics. Identification of temper and inclusions mineralogically consistent with locally available weathered volcanic rocks of acid composition provides firm evidence of local manufacture. Other implications of this work are outlined below.

McGovern (*et al.* 1985:104-113), conducted an "admittedly limited sampling of three periods of Ban Chiang ceramics". Some fabrics show close parallels with the intrusive "bleb" tempered wares at Ban Na Di. This distinctive fabric is recognisable in photomicrographs included in the above publications (McGovern 1985:106, Plate 2, Vincent 1984a:694, fig 15-3B. and C.). Although the magnification levels are different (25x and 80x respectively), comparison of these photomicrographs demonstrates a close morphological similarity between the two tempers. White, however, argues for a lack of equivalence between Late Period Ban Chiang and Ban Na Di. She considers that bleb-temper is absent from Ban Chiang. According to White (1986:263), Vernon, who conducted the petrographic analysis, noted "little if any obvious plant material associated with the grog fragments. Any plant remains were found within the clay matrix". Quite so. This complies with the association noted for other bleb-tempered fabrics. This is an important temper and we will discuss it in detail in the following chapters.

McGovern (*et al.* 1985), in preliminary observations based on an examination of twelve vessels, and subject to a more detailed study, assert that "although there are some similarities in vessel forms, the fabrics of Ban Na Di are clearly different from the wares included in this

study". They argue that the Ban Chiang pottery industry "appears to have been highly conservative". Changes in petrology, clay types, paint, slips, and fabrication techniques are held to "have been minor departures from the well-founded tradition", but these variables also possess potential "in understanding the evolution of the industry". Oscillations between different fabrication techniques, however," are difficult to understand within a continuous tradition". Such changes are postulated to be the result of "culture contact or population movements". Finally, while the firing temperature range is held to be well defined, "more detailed analysis and/or a larger sample is desirable in resolving a number of issues". These are observations which will be considered in the present work.

Glanzman and Fleming (1985:114-121), used macroscopic surface examination and xeroradiography of Ban Chiang vessels to assess fabrication methods. They feel "coil-and-slab" and "lump-and-slab" fabrication techniques characteristically employed by craft potters are readily detected in prehistoric pottery. These methods were "central elements" of Ban Chiang vessel fabrication. Paddle-and-anvil shaping is evident in both complete modern Ban Chiang vessels and ancient examples. The authors identify four Early Period vessels as coil-and-slab, and two as lump-and-slab, four Middle Period were lump-and-slab and one coil-and-slab, while the Late Period revealed three coil-and-slab and one vessel of uncertain fabrication. As with the previous study the sample is small (a total of 15 vessels). Such fabrication studies, however, have considerable potential for illuminating an important aspect of prehistoric ceramic technology.

2.5 Ethnographic studies

Ethnographic studies offer valuable insight into the manufacture and distribution of pottery. This is relevant to the analysis of prehistoric samples if treated with caution. Unfortunately, few such studies have been undertaken in Thailand. Calder (1972) considered manufacturing processes, consumer demands, trade patterns, seasonal production, breakage patterns, replacement responses and variable end-product uses. She noted that the inhabitants of Ban Koeng saw themselves only as consumers, never as producers of pottery. Yet they were familiar with the production techniques employed at the nearby specialist potting village of Ban Mo. Excavations designed to test hypotheses related to breakage modes, and subsequent sherd distributions, provided valuable insight into deposition, transportation after breakage, and sherd wear.

Insight into production rather than consumption is provided by Solheim's study of the southern Thai village of Sting Mor (Solheim 1964). Pottery manufacture provides the economic base of the village. The potters are female, and the manufactory utilises clay produced from "privately owned beds" situated some distance away. Sand temper is added, and a cylinder of clay is wheel formed into vessels, either completed in one stage or partly wheel-formed and subsequently shaped with a wooden paddle and fired clay anvil. Vessel fields are variously treated either with paddle impressions, stamps, or simply by being left plain. In the case of water jars, the impressions of carved paddles used in shaping are smoothed over, but stamps, which vary in motif for each potter are applied to the shoulders. Pebble burnishing and grooving are also employed. Firing is undertaken in vertical or horizontal kilns by men. The kilns are privately owned, and may be rented.

Solheim (1964) has also described the pottery making techniques of the inhabitants of Ban Nong, located *c.* 55 km northwest of Khon Kaen. The inhabitants arrived about two decades earlier from Khorat and Ubon respectively. Carefully selected clay is gathered by men and

women from a pond located five minutes walk away. The temper is prepared by mixing clay with rice husks into the shape of balls about 15 cm in diameter, and then after drying, firing them. During firing, they become red hot, and after firing, they are brown on the outside and black in the centre. They are then taken by women and pounded in a wooden mortar before being sieved through a 3 or 4 mm basket weave mesh. Clay is then mixed with the temper on a mat placed on the ground. While men mix the temper with the clay, women alone construct the vessels. Prepared solid clay cylinders are hollowed either with thumbs, or, in the case of large vessels, a stick, to form both solid and hollow based cylinders. These are secured on a wooden post and enlarged and evened with a rough paddle. The rim is formed by walking round the post, and using a hand-held leaf as the smoothing agent. The body of the vessel is formed using a plain paddle and anvil, and a final carved paddle application impresses a pattern on the shoulders of the larger jars. There are several different forms, and the potters are known to imitate exotic vessels. Each potter produces between 12 and 14 vessels a day, and when 200-300 have accumulated, men fire them on a raft of wood, with grass fuel heaped over them and replenished as required over a period of three to five hours. Solheim noted: "There is much flame, with generally oxidising atmosphere. The surface fires a light brown, with fire clouds common. The paste is usually brown all the way through, but in thicker portions there is often a black core remaining". The basic economic-production unit is the family. Women make the vessels, men market them. While knowledge of potting is retained within the family and community, women coming into the village are occasionally taught potting skills.

At Ban Phan Luang near Luang Prabang, the potters gather clay from nearby fields. It is then dried, pounded and basket-sieved (Solheim 1967). This prepared clay is then water moistened and tempered with river sand until "it feels right". Batches of pots are manufactured in stages, initially on a slow wheel. Two paddle and anvil stages complete the forming, and firing takes place on a grass fueled timber raft. No additional fuel is added during firing, which lasts between 1-1.5 hours.

Bayard (1977a) has described a further potting tradition at Ban Na Kraseng, Loei Province. He noted that clay was collected only from termite mounds. The natural occurrence of coarse sandy inclusions made it unnecessary to add tempering material, so the water-softened clay was simply pounded until uniform in texture and of acceptable consistency. Prepared cylinders of clay were hollowed by hand, then paddle beaten after the upper edge was smoothed and the rim completed. The inner rim surface was then smoothed with a bamboo stick and the shoulder area expanded with a paddle and anvil. A carved paddle and carefully selected river pebble anvil were used. Firing on a log platform fuelled by straw and bamboo lasted from two to three hours or until the vessels were glowing hot. The resultant vessels were found to be "uniform, fully oxidised, brick red in colour" and with little or no fire clouding.

2.6 Style analysis and fabric analysis

Many of the studies described above are concerned with the construction of meaningful relative chronologies both inter- and intra-regionally. This is perhaps a predictable initial response to an area little-known archaeologically. Style is emphasised in most of these approaches. Yet styles often grade imperceptibly, and style analysis alone often fails to recognise imitations of intrusive pottery, or the adaptation of foreign manufacturing techniques and styles in contrast to local innovation.

Fabric analysis, however, when clear geological parameters exist in the raw material source area, can provide firm evidence of provenance, or equally important, the exclusion of certain

areas as sources of raw material. Tempering materials afford evidence of qualitative change. One temper variety does not grade into another, and when examined petrographically, sand, grog, shell, rock or organic tempers are clearly discernible. Extreme conservatism in temper use is widespread (Shepard 1956). Thus temper can provide important information regarding pottery-making customs or traditions, particularly if one temper is preferred to other equally suitable and/or available materials.

The petrographic analysis detailed by Watson *et al.* (1982), the first of its kind in Southeast Asia, provided an example of the importance of fabric analysis for provenance determinations. Six fabrics are evident, 80% of the sample comprising local wares of fabric group 1. However, a meander design, derived from an exotic fabric 6 vessel, was found reproduced in simplified form on a fabric 1 pot. Watson views this as corroborative evidence of the prestige attached to the imported vessel. Clearly, a strictly style-orientated study would have failed to discriminate between these two different types.

This situation is relevant to Bayard's 1977 analysis of the Non Nok Tha burial vessels already discussed above, because his criteria used in defining vessel types did not include temper. Thus his type 1 vessels contained either sand or rice chaff. Given the primacy afforded pottery for "establishing relationships and relative chronologies in the post Hoabinhian" (1977:59), this omission is surprising. It could also be central to the analysis as, according to Bayard, there is strong evidence for a single ceramic tradition throughout the Non Nok Tha sequence.

Table 2.1 below sets out temper types previously identified in Thailand. According to Bayard (1977), Non Non Tha Early Period wares were tempered solely with sand. By the Late Period 50% of the pottery was chaff tempered. In view of potters' conservatism with regard to temper use (Shepard 1956), it seems unlikely that two separate temper types would be concurrently utilized within a ceramic industry of this nature. Evidence set out in following chapters will show that rice tempered wares followed the bleb temper tradition at Non Chai, Ban Chiang Hian, Ban Na Di, Ban Muang Phruk and Non Kho Noi. Both tempers are evident throughout the Sakon Nakhon Basin sites surveyed by Kijngam *et.al.* (1980). Rice and/or rice associated tempers appear to be generally late in this area. It is possible that a similar situation prevailed at Non Nok Tha.

Bayard's assertion that the new temper types probably indicate increased external contact and "movement either of vessels or non-local potters" (1977:82), appears to leave out the possibility of a major cultural change. Continuities in the association of temper, form and surface treatment were actively sought (Bayard 1977:80). Because no funerary ware contained chaff or "sand-and-chaff", and these tempers are correlated with plain wares, the latter are presumed to represent domestic pottery (Bayard 1977:81). Burial vessel descriptions, however, include types that contain these temper species. For example types 1E, 11C, and 1VC contain chaff temper (Bayard 1977:65-72). Bayard later modifies this stance by distinguishing between what are now termed "genuine" "C" and "L" vessels, and "rather crude imitations" (1984:114). The former are tempered with "sand-and silicified-rice-chaff", the latter with sand. These "C" and "L" vessels are held to reflect "two distinct affiliative groups in Non Nok Tha Phase society" (Bayard 1984:105). Major changes in funerary wealth at the end of the Non Nok Tha Phase "could have been due to a takeover of the local authority by a larger and more complex regional entity" (Bayard 1984:116).

Petrographic examination of pottery fabrics in such studies seems worthy of consideration. Such an assessment of the Non Nok Tha funerary vessels could help define the stratigraphy. The site layout may involve an initial core area, representing the first cemetery phase, followed

by subsequent peripheral sequences of burial and/or occupation phases. Sand tempered pottery was found with the early burials. Differently tempered pottery may mark the subsequent burial/occupation phases.

Wichakana (1984a, b), used vessel rims from Ban Muang Phruk, Non Kao Noi and Ban Na Di, to construct a basic framework for the Upper Songkhram Valley's prehistoric sequence. In defining an attribute he followed the general approach used by Bronson (1976). Four attributes, rimform, rim orifice diameter and/or height, surface decoration, and "the broad characteristics" of fabrics were considered. Rim types were defined by a shared similarity of all four attributes. Tempers were identified with the aid of a binocular microscope. Nineteen temper groups were recognised, nine exclusive to Non Kao Noi. The Non Kao Noi rim assemblage is distinct from either Ban Na Di or Ban Muang Phruk.

At Ban Na Di, a dramatic change in the common types occurred at the level 5/6 interface. This coincided with a marked increase in rim types. In addition, many of these latter rims parallel rim types from the basal layer of Ban Muang Phruk. Some Ban Na Di rims parallel types from Non Chai in the Upper Chi Valley (Rutnin 1979). Thin sections of Wichakana's rim types have been prepared by the writer and petrographic descriptions of each are summarized in appendix one.

Chantaratiyakarn (1984) undertook a similar study to that outlined above for Wichakana. This involved pottery excavated at Ban Chiang Hian, a large Middle Chi Valley site, and the related but smaller sites of Ban Kho Noi and Non Noi. One objective was to develop a regional chronology based on pottery typology. As with Wichakana's study, temper, rimform, decoration and size are emphasized. Rimforms similar to those from Non Chai, and Non Dua in Roi Et Province (Higham 1977), were noted.This is reflected in the typological nomenclature. Ban Chiang Hian bodysherds were also sampled, and a major change noted in level 8 (*c.* 600 B.C.). This involved the substantial replacement of previously abundant "red on buff painted wares" by paddle impressed pottery. Wares reminiscent of "Phimai Black" (Solheim and Ayres 1979), and "Om Kaeo" (Preecha and Pukajorn 1976), and a marked development of new types occurred from levels 5/6 (*c.* O A.D.). Thin sections of these wares have also been prepared and examined petrographically by the author. The results are summarized in chapter eight (table 8.4).

According to Rutnin (1979), pottery from the large Middle Chi site of Non Chai was almost entirely tempered with a single temper species. Described as clay, sand and chaff, this temper is identified with 88.4% of the rimsherds and 82.3% of the body sherds. A petrographic consideration of this material is set out in appendix one and chapter eight (table 8.5).

Table 2.1 sets out in chronological order temper species documented by various workers on material from several Thai prehistoric sites. In the light of the objectives outlined above, and discussed further in chapter three, caution needs to be exercised when assessing distributions of temper species identified as attributes for essentially stylistic analyses. Categories such as sand, fibre, grog and crushed potsherds, however, help identify broad temper categories. Hence such information could provide important *prima facie* evidence of regional variations and/or temporal changes in ceramic technologies.

TABLE 2.1: Prehistoric tempers previously identified in Thailand.

Site	Temper	Chronology
Khok Charoen	granitic rock fragments- fabric grp 6	Period 1
	Sand,(probably weathered volcanics)- fabric grp 1	Periods 2/3
	Grog,(containing fabric 1 material)- fabric grp 2	Period 4
Phimai	fine sand	Tamyae
	rice chaff	Phimai
	fine to coarse sand	early historic
Chansen	mineral dominant	Phase 1
	vegetable very common	Phase 2
	vegetable dominant	Phase 3
	vegetable dominant	Phase 4
	vegetable very common	Phase 5
	mineral dominant	Phase 6
Non Chai	clay, sand and chaff	throughout
Roi Et sites:		
Non Dua	fibre 62%, clay 38%	Phase 1
	fibre 68%, clay 23%, sand 8%	Phase 2
Bo Phan Khan	fibre 99%	Phase 2
Don Taphan	fibre 99%	Phase 2
Non Dua	fibre 31%, clay 48%, sand 19%	Phase 3
Bo Phan Khan	fibre 87%	Phase 3
Don Taphan	fibre 93%	Phase 3
Non Nok Tha	sand 92%	Early Period
	sand 67%, chaff 26%	Middle Period
	sand 50%, chaff 50%	Late Period

(Note: the period designations for Non Nok Tha are those given by Bayard (1977). These were later (1984:88) changed to the Phu Wiang Phase (with assumed initial occupation 3000 - 2600 B.C.), Non Nok Tha Phase (later 3rd millenium to between 500 B.C.and 200 A.D.), and after a hiatus the "parahistoric" Don Sawan Phase). Data from Watson *et al.* 1982 for Khok Charoen, Welch (1983) for Phimai, Bronson (1976) for Chansen, Rutnin (1979) for Non Chai, Higham (1977) for the Roi Et sites and Bayard (1977) for Non Nok Tha. In each case the dominant temper is given, and percentages rounded to the nearest number. The locations of these sites are set out in figure 2.1

2.7 Summary

This chapter has reviewed the principal studies into prehistoric ceramics previously undertaken in Thailand. Several were omitted either because they represent further examples of analytical methods already discussed in detail, such as Higham's (1977) Roi Et reports, which closely follow Bayard's approach, or because they are too general or peripheral (for example Hastings 1982, Marsh 1971; Mourer 1977, Schauffler 1976, Vallibliotama 1984, Pukajorn 1984,

and Wong 1982). Other work has been superceded by subsequent studies (for example Van Esterik 1973). Pottery from Khok Charoen was used by Ho (1984), for inter-site comparisons. The fabric groups identified by Freestone are linked to pottery forms. Decoration and shape, however, are given primacy.

The importance attached in the majority of these studies to the concept and analytical validity of "attributes", as defined by European and American theorists, is central to an understanding of their general approach, the exceptions outlined above aside. We have seen that this concept was extended not only to artefacts but to cultures and cultural groups. Thus, in their endeavour to describe and explain socio-cultural similarities and differences, a disproportionate and potentially misleading emphasis has been placed by the majority of earlier workers on ceramic styles. This is in spite of ethnographic evidence that potters imitate exotic styles (Solheim 1964). Such information demonstrates the fickle nature of fashion and its powerful influence on artefact style.

In this report we will emphasise technological analysis and place importance on non-sociological, as well as sociological, influences on ceramic industries in Northeast Thailand. The formula "form plus fabric" (Hulthen 1974, Peacock pers.comm.), best describes the concept of a ceramic "type" used here. Rather than a detailed examination of decoration or morphology, the material of which pottery is composed, its fabric, will not only be emphasized but given primacy.

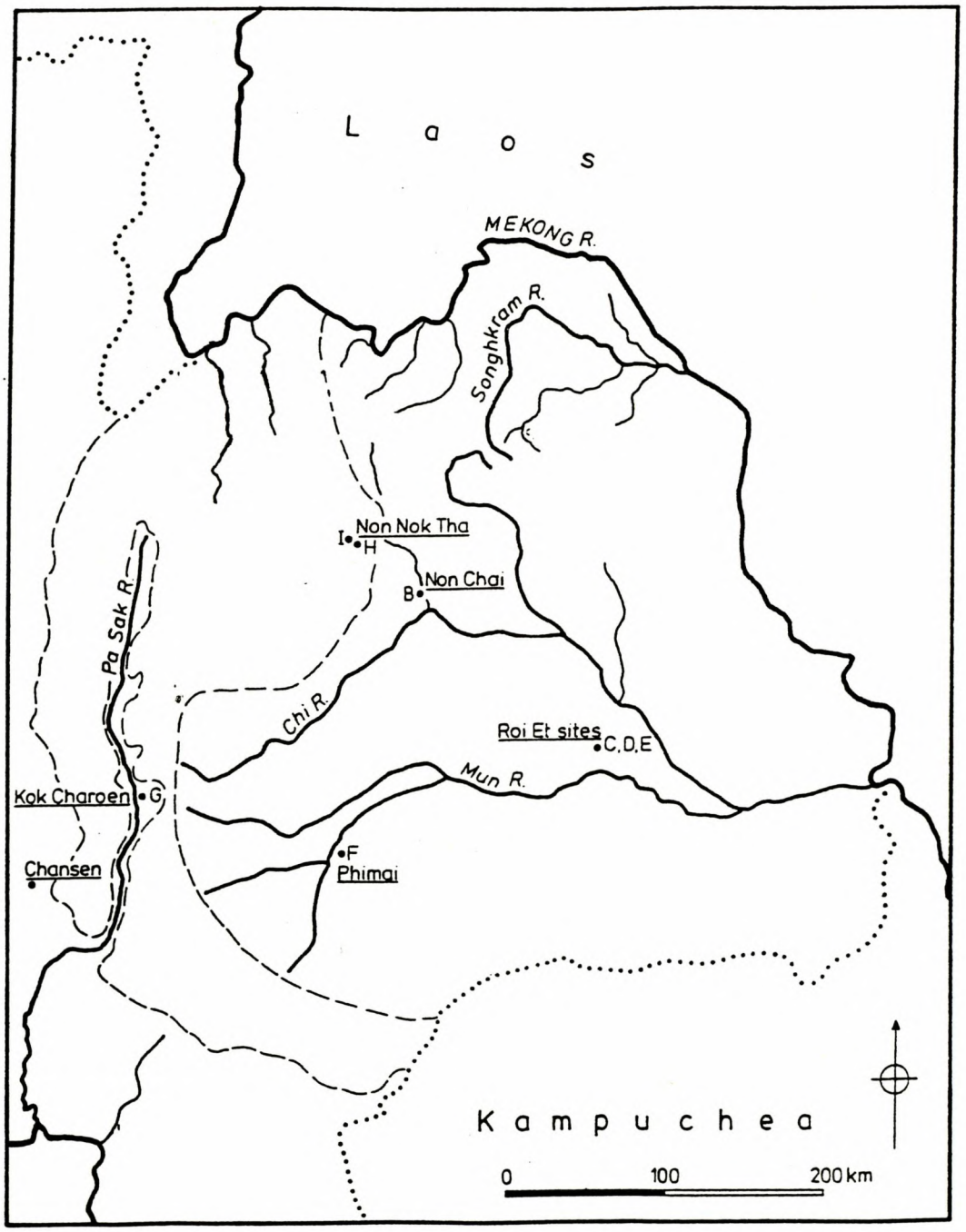

FIGURE 2.1: THE DISTRIBUTION OF SITES WITH RECORDED TEMPER SPECIES

Chapter 3

Objectives and methods

3.1 Objectives

The object of this report is to illuminate the prehistory of Northeast Thailand through an analysis of ceramics from Ban Na Di and related sites within the Sakon Nakhon Basin and the upper Chi and Mun Valleys. We have noted in chapter one that these sites were examined so as to fill a lacuna in evidence regarding claims for early metallurgy. Ban Na Di was chosen for excavation because it lay close to Ban Chiang, one of the postulated very early sites containing metal, and because it occupied an environmental location shared with many surveyed sites. Test excavations indicated a material culture which included bronze and iron. Several more distant sites will be considered where they provide background data of relevance to the developments documented for the Sakon Nakhon Basin. Inclusion of these additional sites assists the theoretical model outlined below by broadening the scale of the inquiry. The potential of petrographic analysis of pottery is documented with reference to the work of Shepard (1936, 1942, 1956, 1965) in the Rio Grande.

In essence, Shepard applied established geological and statistical methods to prehistoric ceramic technology as revealed by archaeological surveys and excavations in the Rio Grande region. The result was, according to Kidder, "not only a valuable contribution to Rio Grande prehistory but an exposition, by what might be called the case system, of the role of ceramic technology in archaeological research" (Kidder 1942:ii). This assessment was later denied by Shepard (1965:62-63) when she argued that "Several distinct circumstances favored the technological study of Pecos pottery". The first included the relationship between archaeologist and analyst which meant that the "archaeological background", "stylistic features and relative dating of the types" were known from the outset "and throughout the study there were frequent opportunities for exchange of information and discussion with Dr.Kidder. Second, the history of the ware was exceptional because its unique decorative technique required a lead ore that was restricted in occurrence. Third, the geological diversity of the region from which the potters obtained clays, nonplastics, and pigments greatly facilitated the location of sources or source areas of these ceramic materials. Consequently, this investigation was a specific, not a general, test". Whether or not Shepard's Pecos investigation was a case study with general archaeological application, is central to the objectives and aims of this report. It is a question that will be tested in the following chapters.

Shepard's research was undertaken against a background of a series of meetings, conferences and papers designed to cope with an enormous corpus of ceramic data derived from both surface surveys and excavated material. The collection of this material began in 1910