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A CRITICAL EVALUATION OF THE METHODOLOGY OF MIDDEN SAMPLING

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INTRODUCTION

In New Zealand, as in coastal areas throughout the world, widespread exploitation of marine food resources in the past has bequeathed, in middens, a vast and intricately worded account of prehistoric subsistence patterns, to challenge the patience and ingenuity of the archaeologist. The challenge has been met with such a curious array of techniques and methods that, at the risk of having it objected that his approach is neither, the author considers it time to introduce some common sense.

The purpose of this particular paper is, first, to critically evaluate a selection of methods concerned with the basic sampling problems of choosing areas of a midden site for excavation and samples of the material for analysis, and second, to present a common-sense approach to the problems.

MIDDEN SAMPLING

Every excavation, including total excavation of a site, produces a sample only, which consists of the surviving remains of local prehistoric activity which was, itself, a sample of a much larger universe of man-man and man-nature events and processes (c.f. Clarke, 1973). Thus the question of whether one ought to use sampling methods in archaeology does not arise. At issue, rather, is what kind of sampling procedure will best provide the information considered most appropriate to particular research objectives.

Midden excavators have generally held in common the primary objective of obtaining a sample, smaller than that provided by total excavation, from which it is possible, implicitly or explicitly, to derive the composition of the site as a whole. A secondary consideration has frequently been that the sampling method should be free of observer (excavator) bias.

The theory of sampling is exceedingly complex, but in general terms the choice lies between samples taken systematically and samples taken randomly. Both modes have been proposed to rationalise the choice of

areas within a site for excavation, and the choice of samples of the excavated material for analysis. The three commonest methods are cluster sampling, random sampling, and column sampling. Normally the first two have been considered in terms of the problem of selecting areas of a site for excavation, and the last in terms of selecting samples, following excavation, for analysis. However, as cluster and random sampling could be applied to the latter problem, and a variant of column sampling - coring (Reed et al, 1968; Casteel, 1970; Fry, 1972) - applied to the former, there is no need here to subdivide the midden sampling problem in general.

An assumed precondition of this consideration is that there are research objectives which require comprehensive excavation of a midden or middens. In situations where that is not the case the comments which follow may not be applicable, but if this is so the question of whether the site ought to be disturbed at all requires close examination because middens, more than most sites, have suffered far too much from excavations in which interpretation of the bulk of the material has been merely an adjunct to the pursuit of other objectives.

SAMPLING METHODS

Cluster and Random Sampling

Typical cluster and random sampling methods for archaeological purposes have been described by Vescelius (1960), Rootenberg (1964), and Chartkoff and Chartkoff (1968). They approach excavation as purely a sampling problem. Rootenberg (1964, 181) for example, claimed that "no matter what the specific reason the archaeologist has for excavating a site, once he begins his sampling operations he should have only one immediate field objective: to collect as representative a sample of elements as possible from the site with a minimum expenditure of time, labour or money."

The basic strategy of the methods is as follows: a site or group of sites is divided into units (by erecting a grid or by using surface features) and these units are then systematically sampled and randomly excavated (stratified cluster sampling) or randomly sampled and excavated (random sampling).

Column Sampling

Column sampling was developed and tested by the Californian archaeologists concerned with midden analysis a quarter century ago (Treganza and Cook, 1948; Gifford, 1949; Cook and Treganza, 1950; Cook and Heizer, 1951; Heizer and Cook, 1956). In this method columns

of midden of a certain area - 6" x 6" for example - were taken from regularly spaced or predesignated sections through the site: each level or layer being separately bagged. The method quickly became standard practice throughout the Americas (Willey and McGimsey, 1954; Meighan, 1959; Reinman, 1964; King et al, 1968) and the Pacific in general (Gifford and Shutler, 1956; Wallace and Wallace, 1969; Emory et al, 1969) including New Zealand (Davidson, 1964; Scott, 1970). It was frequently supplemented with more or less arbitrarily grabbed samples of major site components.

EVALUATION OF THE METHODS

Sampling Problems

Before the methods can be evaluated it is necessary to consider what may be legitimately assumed about the site for which sampling is contemplated, specifically, the manner in which the sub-surface components are distributed. Can it be reasonably assumed that the components are all perfectly, that is randomly, mixed? The patterned nature of most aspects of human behaviour, and all archaeological experience to date, suggest that such a situation would occur very rarely. Can it be reasonably assumed, then, that the components are distributed according to some even pattern? Again this is very unlikely unless the site is composed of one component only. Each component may be laid down in a more or less evenly patterned fashion; a lens of pipis, then a lens of cockles, a lens of pipis, a lens of cockles, and so on, but other components such as bird bones, flakes, hearths, postholes and burials may follow different patterns so that a sample designed to elucidate the pattern of one component may produce biassed results for another. Thus Treganza and Cook, in testing column sampling against total excavation in a particular midden, found that although the fine material was sufficiently well distributed that 25 samples would have accurately predicted its component proportions in the whole site, over 2,000 such samples would have been required for material over 3/8th" in size. Their conclusion that the "desirability of complete excavation cannot be over-emphasized" (op cit, 297) is indicative of the doubts which must arise when it cannot be assumed that the site components are either randomly mixed or follow a single even patterning.

The only viable alternative is the imprecisely formulated assumption that what lies under the surface is composed and distributed according to the local prehistoric behaviour which produced the site. Field experience may allow further assumptions, such as that the material in a particular midden is likely to be largely the remains of intertidal shellfish, but assuming any more precise composition or

distribution is unacceptable.

What does this mean in terms of sampling?

Firstly, it is clear that neither systematically nor randomly taken samples will produce unbiased results, except by chance, unless the site is randomly mixed. Even where it does happen by chance the excavator will not know this unless he also excavates the midden entirely and compares the results: there are no rules or laws available for calculating errors of bias (Tippett, 1968, 73). In any case, if it were possible to show that the site components were completely mixed, a single random or systematic sample would have served as well.

Secondly, since it is impossible in advance to determine the nature of any patterning which might be displayed by the distribution of the site components, or to reliably predict, following excavation, the patterning of the unexcavated portion of the midden, there can be no guarantee that any systematically or randomly taken samples will produce representative results. The suggestion that random sampling, for example, does this is fallacious. Schefler (1969, 38) has observed that "it is important to note that the term 'random' as applied to a sample refers only to how it was drawn, and does not guarantee how representative it is. The terms random and representative are too often considered to be synonymous when, in fact, they are not." The same is true of any systematically taken sample. Particular techniques taken from both modes of sampling may well remove excavator bias, but removing that source of error does not, ipso facto, remove sample bias as well. What is more, even if it did there is no way of demonstrating the case short of comparison with the results of a total excavation of the same site.

These are clearly serious deficiencies, but it is sometimes the case in archaeology that we have to accept methods whose precision is dubious, or even unknowable, simply because there are no others available at the time to meet certain objectives. The midden sampling methods considered here, however, have some serious, if not unacceptable, practical problems as well.

Practical Problems

Using cluster or random sampling methods to decide in advance which squares are to be excavated and which not allows the archaeologist very little freedom in matters of sub-surface stratigraphy and structure, because once the choice has been made there can be no deviation from it without the lack of bias being lost. Such

methods may exacerbate problems of linking layers from one area to another and, in addition, present the excavator with a sample which includes only portions of whole structures, burials, posthole patterns, and so on. Leaving the choice of excavation areas to chance is clearly likely to produce results of the same status as those obtained by mixing chemicals at random: a puzzling if not dangerous mess.

An equally serious practical deficiency of column sampling is that it selects for analysis only a very small proportion of the material excavated. Thus while the bulk of the potential subsistence information goes on to the dump the archaeologist is left, ironically, trying to reconstruct that information from his samples. Moreover, column sampling has too often encouraged an attitude in which site components are accorded differing status. Thus while structures are carefully recorded and artefacts and burials removed in full, the faunal material is largely disregarded. Modern archaeology, with its emphasis on understanding cultural systems as a whole can no longer accept such an attitude.

A COMMON SENSE APPROACH

The sampling and practical difficulties of cluster, random and column sampling leave us with two alternatives. These are to totally excavate sites, or to sample them by excavating in plan, in areas chosen by the archaeologist according to his research objectives: understanding in both cases that the material excavated should be analysed in full. This latter corollary must, of course, influence the choice of areas to be excavated, and the dimensions of the excavation undertaken.

Leaving aside the question of whether it is desirable to totally excavate sites, it is seldom a practical proposition with middens ranging up to the size of the Emeryville Mound in California which was estimated to have been originally some 150,000 cubic yards in volume (Schenck, 1926). Thus we are left with the alternative of partial excavation.

In accepting such a choice it is clear that midden excavation objectives must be different from those implied by the use of the sampling methods discussed above. There cannot be any reasonable suggestion that a deliberately chosen partial excavation provides a representative sample. Although there may be cases where it is interesting and useful to treat such a sample as if it were representative, it has to be acknowledged that the Holy Grail of total site prediction is unattainable.

Rejection of this objective is not, however, a methodological deficiency; far from it. Choosing an area for excavation in terms of research objectives, and restricting interpretations of midden analysis, in the main, to what is known rather than surmised, is not only common sense, but also recognises the differing factual status of knowledge obtained in the various stages of the archaeological process (c.f. Leach, n.d.). Moreover, the ideal of analysing all the material excavated, while not always practical or possible to attain, has to be maintained if balanced interpretations of the nature of a sample's composition are to be made, if not for ethical reasons as well. Sieving is clearly often necessary in the field to remove most of the non-cultural matrix of a midden, but since the demonstrations by Fitch (1969). Follet (1969, 1970) and Payne (1972), amongst others, of the remarkable differences analysis of the fine fractions of midden may make to interpretations of site composition, it can no longer be used simply as a means to lessen the bulk of the sample retained for analysis.

Finally, excavation in plan is vital to any attempt to capture the patterns of distribution of components within a site.

CONCLUSIONS

Cluster, random and column sampling methods are based on a fundamental misconception of the nature of sampling. In situations where the qualities of the sampling universe are unknown and cannot be assumed, there are no methods available which can produce a sample known to be representative and there is no way of determining the degree of bias in any sample obtained, short of examining the nature of the universe as a whole. As a consequence, the primary midden sampling objective of predicting the composition of the midden as a whole is dubious.

A more sensible approach is to reject that objective as primary, to excavate on the basis of research objectives rather than chance, and to restrict interpretations, in the main, to the results of a full and careful analysis of everything excavated. If there is any doubt about the general validity of this assertion it may be recalled that sites such as Star Carr and Catal Huyuk, which still glitter in the annals of archaeology, were examined in just this fashion.

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