ARCHAEOLOGY IN NEW ZEALAND

ADZES FROM KOPUARAHI: THE POTENTIAL FOR SUBDIVISION OF TYPE 2B ADZES

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INTRODUCTION

That the adzes from New Zealand have a great diversity of forms is a truism. The typologies that have been applied to New Zealand adzes have been effective at describing the variety. However they have betrayed their origins through South Island based scholars in a bias towards differentiating varieties which are of greater numerical importance in South Island assemblages, assemblages in which Archaic forms are more frequent. The typology most commonly used, that of Duff (1956) of course can adequately describe North Island Archaic assemblages as well. Duff and others for the sake of completeness include a category of adze to encompass much of the later North Island adzes, 2B, described as being of tangless quadrangular section, finished all over with rounded edges and cutting edge formed as the wedge-like apex of the back and front (Duff 1945 : 163-4). While the 2B adze must be accepted as a type within the total range of New Zealand adzes, it is also numerically the most frequent type and stands suspect in that. In parts of the North Island it is virtually the only type found. However, within itself it is not highly uniform. It varies considerably in size and in proportions so the energy available to do work, implicit in the mass of the adze head once swung, varies considerably, and especially so once the blade width is taken into consideration. A deep parallel sided adze can have much greater energy delivered per centimetre of blade width compared to a thin broad adze which tapers away from the blade.

It is unsatisfying when presented by North Island assemblages to find most adzes in a single type when this type has evident variation within it. This study is a small attempt to see if the variation with the 2B type can be expressed in a way which has some archaeological value. The adzes studied were 35 complete adzes from Kopuarahi (Murdock 1963, Green and Green 1963) in the private Murdock collection.

A nearby site Oruarangi/Paterangi (Shawcross and Terrell 1966) has another large collection of adzes which have been the focus of some study and taken as a classic Maori Collection (Golson 1959). Fisher (1936) identified two shapes within the assemblage which he identified being typical of two regions, Type A from Waikato/Thames and Type B from North of Auckland (see Table 1). Shawcross and Terrell were somewhat critical of Fisher's split of the assemblage into these types for they could find only faint evidence in the metrical data presented by Fisher that the gross shapes (length, breadth, thickness) differentiated cleanly (Shawcross and Terrell 1966 : 422) They added little to the

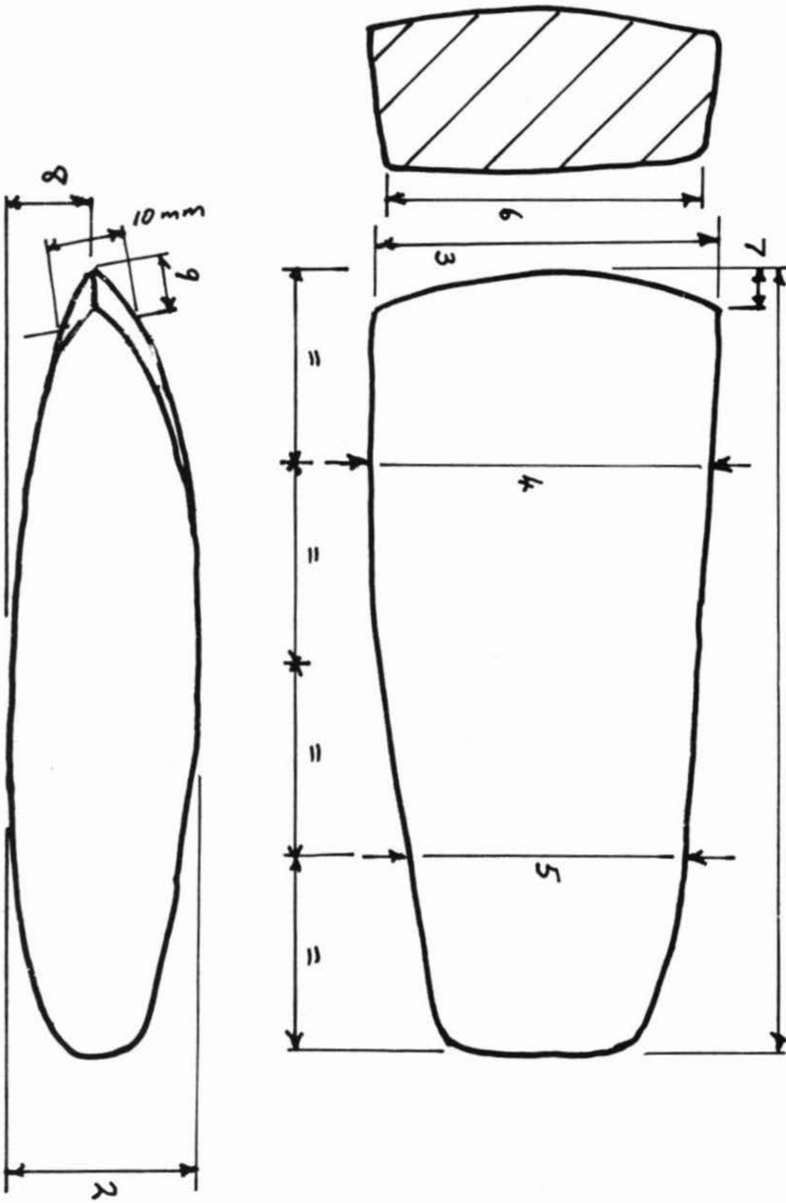

Figure 1. Dimensions recorded defining the shape of the adzes. Dimensions **4** and 5 are on the face of the adze. Dimension **6** is on the back at **1/4** length.

debate beyond that though they admitted the possibility that types might exist to be revealed by more sophisticated study.

Best also reviewed this same collection and noted that the adzes formed of Tahanga basalt quite often fell outside the 2B type in having some modification for hafting. Best (1977 : 322) noted that the depth to width ratios for the Tahanga basalt adzes in the collection were higher than for the adzes of other rock materials. Further, rather than being a characteristic late collection Best suggested the site covers a transition from earlier Tahanga basalt dominated adzes to a later collection (i.b.i.d. : 323). This long discussion to Oruarangi is of some interest as Fisher's types are the only attempt of any weight to differentiate the ubiquitous North Island 2B adzes and as will be seen below receives some support in this study.

THE COLLECTION STUDIED

The collection originated from uncontrolled excavations and in consequence its time depth is not known. At the time of study it was displayed in the Murdock Museum as a single site collection. By comparison to the Oruarangi collection it is apparent that the variation suggesting time depth noted there by Best is absent here. Angle butted or tanged adzes are not apparent in the collection. The adzes are uniformly finished all over. The lithologies were not researched, but no great range was immediately apparent. The Murdock collection catalogue raises some problems in the site attribution for three of the adzes. Two have double entries assigned alternatively to Patetonga and Opito. The third is assigned to Wheritoa. I am indebted to Louise Furey who is currently studying the Murdock collection for her cross check on this. These questionable attributions do not make the analytical approach used here invalid. They would need to be resolved if the output classification was to be used to look at type frequency differences between sites.

STUDY METHOD

As variations in size and shape were the target of the study the techniques of numerical taxonomy seem appropriate The method applied was that of "K Means" clustering analysis previously applied successfully by the author to nephrite pendants (Law 1980) and to shell fish-hook points (Law 1984). The method uses dimensional measurements taken on artefacts as continuous variables. It attempts to divide the artefacts into a number of groups or clusters (the number algebraically expressed as "K") with each of the groups centred on a means of the group (hence "K Means"). Various numerical techniques can be applied to make the groups as tight as possible. For any useful number of measurements and objects computer assistance is essential. The resulting groups are sometimes dependent on the starting points for the means which are used to start the process and hence some repetition with different starting points

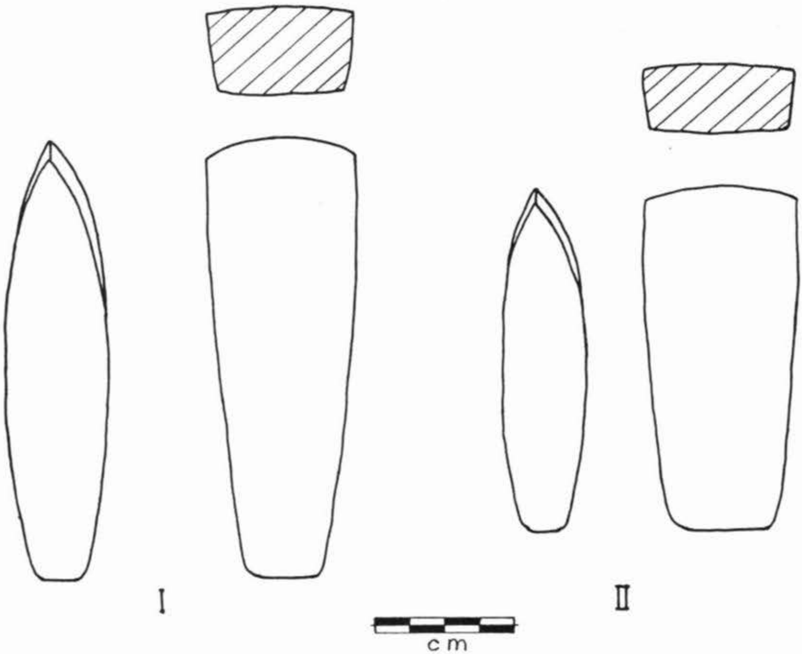

Figure 2. Type adzes reconstructed from the dimensions of the means of the two clusters which most efficiently encompassed the variation of the collection.

are needed to ensure the best clustering has been found. As applied here the data is converted to remove correlation and is normalised before clustering using Euclidean distances as a measure of distance from the mean to an object. After tightening these clusters by exchanging objects between clusters where this advantages the tightness of the clusters, the clusters are readdressed using Mahalanobis distances as a measure of distance and objects reassigned if they fit better. This is a more robust measure of distance once the clusters are defined. This tightening needs several passes as reassignment requires the variance/coverance matrix for the within - cluster variance to be recalculated at each pass, in turn altering the calculation of Mahalanobis distances.

Nine dimensions were recorded for each of the adzes. Figure 1 defines these. The dimensions were selected with a draftsman's eye as being sufficient to allow a reasonable representation of the shape of the adze to be drawn.

Thirteen trial clusterings were performed looking for two clusters (ie $K = 2$). No higher values of K were considered in this study given the relatively small number of objects under study. This is not to say that a higher number of types might not be definable, just that a larger study with more adzes would be needed to undertake it.

It is possible to criticise such a study from two bases. Firstly the now widely accepted thesis of adze form following lithology might be held to indicate one was going to discover in shape no more than an expression of variation in lithology. Yet Maori clearly imposed culturally preferred shapes onto intractable rock types, so there is a cultural dimension to adze shapes. Moreover it requires acceptance of their only being one shape for all functions adzes were applied to. This is sustainable as a null hypothesis and is only falsifiable by looking for variation. Secondly it can be hypothesised that curation of blunted adzes changed their shapes. In contrast to Archaic adzes we know virtually nothing about the curation of 2B adzes. If they were curated in a way which distorted culturally preferred shapes, then this should be systematic and describable as shape types and does not invalidate the approach.

RESULTS

The best clustering of the 13 trials divided the assemblage into two groups of 8 and 27 adzes respectively. The adze assignments to the groups are listed in an appendix. The adzes most characteristic of the clusters are also indicated in the appendix.

However from the group means the adze size and shape which is the exact best fit for each group can be reconstituted and drawn using the dimensions calculated. Figure 2 shows the resulting representatives of two adze types. As can be seen type I is longer, deeper and in plan tapers more to the poll while type II is shorter, thinner and closer to rectangular in plan form. In shape of the blade region the types are very similar but type I is closer to the double bevelled form than is type II. However the blades could not be described as radically different. Best argued blade geometry was deterministically linked to the toughness of the rock type used. Hence these types stand outside that argument.

The width (at 1/4 length) to length ratio is .33 for Type I, .45 for Type II. The thickness to width (at 1/4 length) ratio is .71 for Type I, .55 for Type II.

These types have internal relevance to the assemblage from which they were derived. They are an efficient way of describing variations in that collection.

What other relevance do they have? Only a larger study incorporating other adzes and site assemblages would be able to answer this fully. However, there is an interesting hint in Fisher's earlier work. His Oruarangi types A and

B are reasonable matches to types I and II from Kopuarahi respectively matching A to I and B to II, differing only in that Fisher defined his Type B as having a short steep bevel in comparison to Type A. This is not supported here. While we might have our doubts about the methods whereby Fisher arrived at his types their close replication from an adjacent site is surely of some interest.

Fisher's classification of the Oruarangi assemblage had his Type A the most numerous, the reverse of Kopuarahi if the type equivalence holds.

Overall this study suggests that the vein of adze studies, mined for as long as archaeology has been studied in New Zealand, still has some bonanzas to yield, but perhaps only to the most systematic of studies.

ACKNOWLEDGEMENTS

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APPENDIX

Adze to Cluster assignments, Murdock collection numbers.

CLUSTER I

M507, M506, M505, M502, M504, M503, M508*, M509

CLUSTER II

M532, M522, M235, M513, M519, M523, M516, M514, M518, M547, M525, M528, M531, M529, M520, M527, M546, M526, M517, M515*, M340, M342, M524, M521, M511, M510, M512

* Most typical of each cluster.

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Table 1. Fisher's Oruarangi Types

A	B
Long	Short
Narrow	Broad
Thick	Thin
Front slightly convex transversely	Front slightly convex transversely
Front convex longitudinally	Front sl. convex longitudinally
Bevel acute	Beval short and steep
Tapers to poll	Tapers slightly to poll