An Analysis of an Open-air Workshop in Palliser Bay

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ABSTRACT

A small assemblage of stone flakes and tools left in a natural hollow in an abandoned garden is interpreted as the debris resulting from a brief period of work by one or two artisans. Detailed analysis of the drills and utilised flakes suggests that wood-working of small items was the major activity in this open-air workshop, and that these items may have been perforated. It is argued that chert and obsidian were used interchangeably for scraping tasks, but that obsidian was more highly valued as a material.
Keywords NEW ZEALAND, PALLISER BAY, PREHISTORIC, STONE TOOLS.

INTRODUCTION

As part of a research project investigating stone walls and alignments of eastern Palliser Bay (H. Leach 1976, B. F. and H. M. Leach 1979), excavations were conducted at the Washpool Walls site (N168-9/20, M1/XI-XXVIII) in 1970 (Fig. 1). The stone features were found to have served as garden boundaries and in some cases as dumps for stones cleared from adjoining gardens. Horticultural activities at this site were dated by the radiocarbon method to the early 16th century (based on a best estimate date of A.D.1538 ± 49, calculated from NZ-1513 A.D. 1608 ± 78, NZ-1514 A.D. 1442 ± 79, and NZ-1512 A.D. 1562 ± 79 without secular corrections). Cultural evidence was concentrated in one layer (Layer 2) which was overlain by a turf and root zone. Layer 2 varied from a thick brown sandy loam away from the walls to a black, charcoal-enriched sand within the walls. Beneath it, Layer 3 consisted of grey sterile sand whose upper portions were occasionally stained reddish-brown and contained small lenses of charcoal, believed to have been incorporated by cultivation after slash-and-burn clearance of the land.

A natural hollow in square XVIII into which a single boulder alignment was traced was found to contain a surprising number of small stone tools and waste flakes (437 items from a total site assemblage of 508). These were concentrated in a semi-circular pattern around the base of the hollow, which also contained a small hearth, built against the side of the boulder alignment (Fig. 2). Few flakes were found in the immediate vicinity of the hearth where, it is argued, one artisan (certainly no more than two) squatted with his back to the alignment and the fire. Industrial debris accumulated in a semi-circle in front and to each side.

The relationship between the gardening and industrial activities carried out at the site is not believed to be functional: that is, the artisan was not necessarily manufacturing or modifying objects connected with gardening. A more plausible explanation of the evidence is that previous land clearing and gardening operations had created a patch of open ground in a sheltered hollow, ideal for a small open-air workshop. The flakes and discarded tools fell on to soil already modified by cultivation, so the activity post-dated gardening. The depth of vertical incorporation of the flakes, however, indicates that vegetation on the area had not yet regenerated. Hence the workshop was in use very soon after the last period of cultivation. Had gardening continued after the industrial activity, the semi-circular distribution pattern would probably not have survived. The presence of flakes in adjacent, incompletely-excavated squares (18 flakes in square XIX, 10 in XX and 40 in XXII) may indicate that other workshops had been set up.

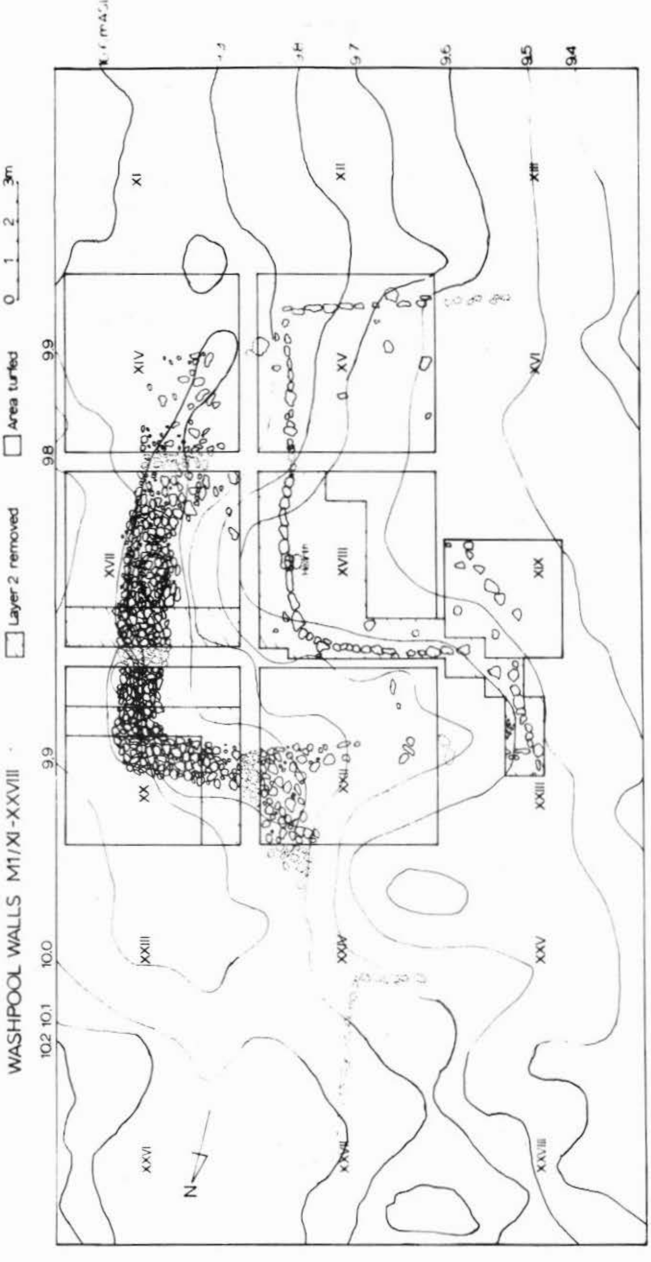

Figure 1 Washpool Walls Site N168-9/20, M1/XI-XXVIII showing location of "workshop" in Square XVIII.

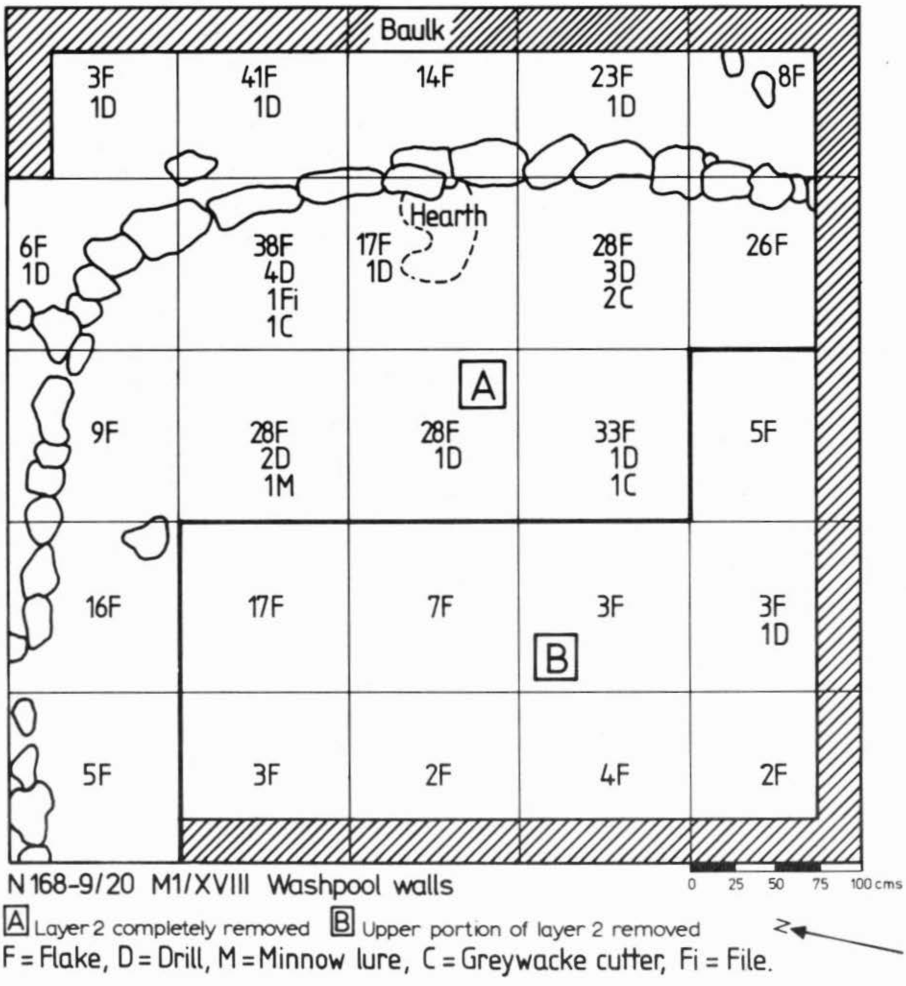

Figure 2 Square XVIII showing hearth and distribution of flakes and other tools.

In keeping with the stress placed on reconstructing human behaviour by the Otago University Wairarapa research team, it was decided that the contents of this, the best represented workshop area and its surroundings, should be examined in detail to see if the activities carried out there could be established. Stone assemblages on large multi-activity sites, such as the adjacent Washpool Midden Site (N168-9/22), were considered far less manageable. Not only were they much larger, e.g. more than 11,000 items, but they spanned several periods of occupation and obviously resulted from a wide variety of operations. In contrast, this site offered a small assemblage probably left by one or two artisans who had worked there briefly.

Several interrelated facets of the assemblage were studied: types of material, artefact morphology, and evidence of use.

MATERIALS AND TOOL TYPES

The stone material from the Washpool Walls site comprised a variety of rock types derived from sources as far afield as the Coromandel Peninsula and possibly Central Otago (Prickett 1975).

Obsidian was the most numerous category. Of the 237 pieces, 79 were clearly utilised flakes (Fig. 3a), and one had been fashioned into a drill point (Fig. 3f). A further 40 showed minor edge damage which might have occurred after burial in the sand or during excavation. Of a sample of 22 flakes examined by X-ray fluorescence spectrography, 18 were from Mayor Island, and the rest from Cook's Bay, Coromandel.

The next most abundant material was chert, of which there were 194 fragments comprising seven cores, 12 drill points (Fig. 3c, d) and 42 utilised flakes (Fig. 3b). A comparative study of cherts from Palliser Bay sites and various east coast sources indicates that these were most probably derived from chert outcrops and stream-bed boulders in the White Rock-Oroi-Tora area of the eastern Wairarapa coast (Prickett 1975).

The metasomatised argillite, on the other hand, was almost certainly of South Island origin. Indeed, some pieces can be confidently ascribed to the Ohana quarry area on D'Urville Island. There were 38 pieces of Nelson-D'Urville argillite in this site, all but one found in the workshop hollow. Included in this total are five utilised flakes, and five drill points (Fig. 3i). A high proportion of the argillite assemblage bore traces of hammer dressing or polishing indicative of breaking up and reworking of argillite adzes. At least 17 flakes were clearly struck from adzes and it is likely that the remainder had a similar origin, if colour and textural comparison are any guide. The striking platform for one flake was the edge of a complete transverse fracture through an adze, proof that broken adzes were being used as sources of raw material for utilisable flakes. It is not surprising that the argillite tools, although not all possessing remnants of polish and bruising, match closely those flakes which are recognisable adze flakes. This use of broken adzes for drill and flake tool manufacture suggests that even damaged adzes were valuable to these people, a value enhanced by distance from sources of fine-grained and durable materials.

Probably the only material available in any quantity locally was greywacke, which occurs in boulders on the beach and in river and stream beds. Despite its ubiquity it was obviously of little value in this site for only 14 pieces were found. Three of these bore traces of polish overlying hammer dressing, and one of these flakes showed the intersection of surfaces of a quadrilateral adze (front wider than back). In fact these pieces and several of the greywacke waste flakes could derive from one adze. Another three greywacke items could be described as "attrition saws", one as a hammerstone, and one as a "grinder". All were made from waterworn boulders of greywacke, of poorer quality than the material used for the polished tools.

Seven other types of stone were present in this assemblage in small quantities. Siliceous limestone (probably from the White Rock area) was present as a large drill (Fig. 3h) and four waste flakes. Schist was represented by a small "file" (Fig. 3g) and a broken unfinished minnow lure (Fig. 3e). The latter item was obviously intended to have a triangular cross section but had snapped transversely before the two longitudinal grooves joined. Interestingly the grooves accommodated one of the greywacke "saws" very neatly. It is likely that this schist was obtained from the Nelson-Marlborough area (Prickett 1975:156). One utilised flake of serpentine may have originated in the same area. Both sandstone (three fragments, two from a grindstone) and unbaked argillite (one utilised piece from an unfinished minnow lure) could have been obtained in the Aorangi Mountains. Three flakes of quartz crystal were recovered and three of a white material which in hand specimen was identified as silcrete (orthoquartzite). The nearest source of this material would have been the South Canterbury-North Otago interior.

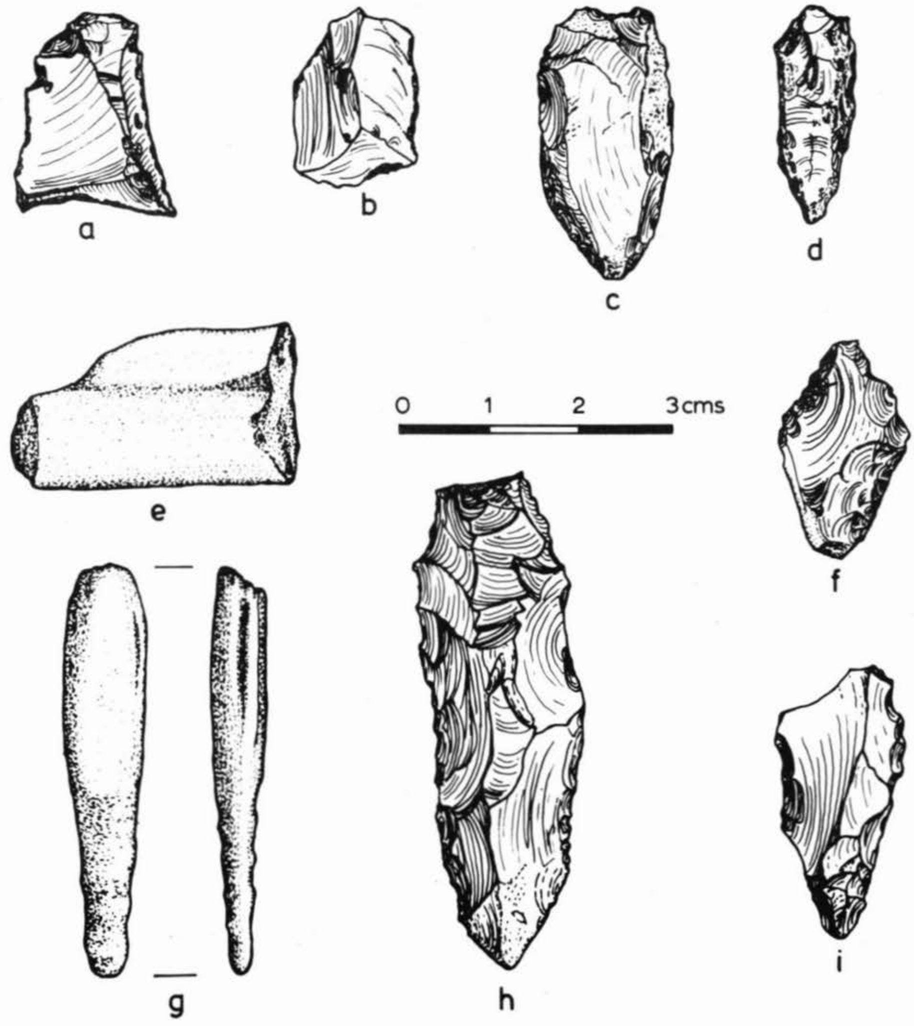

Figure 3 a. XVIII/16 Layer 2. Obsidian flake showing three areas of edge damage.
b. XVIII/17 Layer 2. Chert flake showing three areas of edge damage.
c. XVIII/8 Layer 2. Chert drill.
d. XVIII/17 Layer 2. Chert drill.
e. XVIII/18 Layer 2. Broken unfinished schist minnow lure.
f. XVIII/12 Layer 2. Obsidian drill, possibly double ended.
g. XVIII/17 Layer 2. Schist file.
h. XVIII/21 Layer 2. Siliceous limestone drill.
i. XVIII/13 Layer 2. Metasomatised argillite drill.

The overall impression given by this assemblage is of a great variety of imported materials and relatively few items of local origin. In its variety it resembles the assemblage from the upper layers of the neighbouring Washpool Midden site (N168-9/22) which are believed to be contemporary with this wall complex (B. F. Leach 1976: Fig. 39).

TOOL TYPES AND FUNCTIONS

The task of determining the various activities which produced a particular assemblage has always been a stumbling block for the New Zealand archaeologist, although attempts have been made recently to associate edge damage patterns on flakes with particular work operations by experimentation (Morwood 1974, Roe 1967) and by striation analysis (Jones 1972). These studies must be regarded as preliminary approaches to the problem rather than solutions, for they have been confined to one material, obsidian, and to one type of "tool", the conchoidal flake with modified edges. So far it has not always proved possible to distinguish edge alteration in preparation for use from that of damage incurred during use. Jones commented that:

> Both the archaeological and the ethnographic evidence suggest therefore that the idea of "retouch" may be a more complex inference than has previously been thought and that edge morphology may be the result of deliberate modification prior to use, deliberate modification during use and actual damage or blunting of the edge. (Jones 1972:151)

The treatment of other classes of tools is no further advanced. The drill point, for example, is identified on morphological grounds and in most publications is assumed to have functioned in drilling out the centres of one-piece fishhooks, e.g. Millar (1971). There have been no comparative studies of drill diameters and hole diameters in fishhook tabs from the same site, nor of the edge damage and depth of penetration of the drill point. However, Millar (1971:169) noticed "a brownish deposit (bone powder?) . . . ingrained in the small flake fracture concavities of some points". Nicholls (1964:36) in a study of 61 flaked points from Ponui Island revealed an anomaly which may be present on many sites, when she failed to find

> much correlation between the distribution of flaked points, sometimes called drills, and the fishhook bone material that is normally assumed to have been worked with them . . . The relatively small amount of worked bone to the large number of "drillpoints" does tend to suggest that they were used on a wider range of material.

There have been no detailed studies of "files", "saws", "abraders", "grindstones", or any of the other categories of tools so readily, if prematurely, identified by New Zealand archaeologists working within the European tradition. Technologically, the manufacture of a fishhook requires a tool to cut out the bone tab, a drill to bore out the centre by one large or a series of smaller holes, and files of various sizes to shape and smooth the hook. The problem for the archaeologist is twofold: to identify the various tools which served as files, saws and drill points, and to determine what was being made with them.

DRILLS

In this site there are 19 retouched flakes and small cores which had been shaped to a point and which show signs of crushing and ultimately smoothing of the point[1], together with gloss on raised edges or other protruberances for some distance back from the point. This type of wear is consistent with use as a drill point. Five of these drills were made of argillite, believed to have come from broken adzes. The amount of wear varies from a freshly flaked drill with only minor crushing on the tip to a drill in which gloss has extended to the sides so that the capacity to bite into bone or wood would have been negligible. This drill was broken and the sharp edge of the break shows unifacial edge damage. Another argillite drill had suffered damage to the tip which rendered it useless but rather than discard it the artisan flaked another drill point at the opposite end, perhaps a further indication of the value of argillite to these people.

The largest drill in the assemblage was made from siliceous limestone (Fig. 3h), and is a very well flaked core of regular triangular section. Although this material appears to be softer than argillite, the drill is not the most worn example in the collection and may not in fact have had much use. Undoubtedly the most surprising choice of material for a drill point is obsidian. Only one obsidian drill point is present but its crushed tip and circular striations close to the sides leave no doubt as to its function. The opposite end of this flake is also pointed and shows lateral edge damage consistent with rotation but the point itself has very little wear. It is possible that the edge damage resulted from use as a scraper, and several of the drills show comparable wear. This could, however, result from the use of the drill in a cavity which had already broken through to the outer side of the tab or block. In such circumstances the point would suffer minimal damage compared with the edges.

The most commonly employed material for drills was chert. Of the 12 examples, two have quite sharp points but possess lateral gloss, and another has been broken so close to the point that its identification as a drill tip rests on the similarity of edge preparation rather than any use criteria. One complete drill is a fine example of a double ended drill with crushing and gloss obvious on both ends and adjacent margins. The other chert drills come in a variety of cross sections and the extent of the gloss indicates varying depths of penetration of the drill during use (Table 1). The gloss is not always visible to the naked eye, presumably where the drill has had little use in abrasive materials, but it can usually be detected with a low power binocular microscope (x10).

Once the zone of gloss was identified the drill tip was inserted through a sheet of cardboard until this depth was reached and then rotated. For all rock types this proved to be a quick and useful method of determining the diameter of the largest hole ever drilled by a particular tip. It is argued that this measurement is of much greater cultural significance than any overall length or breadth measurements which it has been customary to make (e.g. Nicholls 1964:30). In the absence of any drilled items from the Washpool Walls site, an initial comparison was made with holes drilled in bone and shell tabs from the Washpool Midden nearby.

The bone tabs and hooks showed that two methods had been used: either a ring of intersecting straight-sided and small diameter holes were made or a single larger hole with sloping sides. The small holes are 3 - 6mm in diameter, and no drill in the entire Washpool Walls collection is small enough or narrow enough to have drilled them. The single-hole fish hooks have diameters up to 9mm, but only nine of the 21 drills are of comparable size. Similarly all the shell fish hooks from the Washpool Midden site have central holes with surface diameters 6 - 9mm (measured on the surface because of the sloping sides to the holes).

Archaic sites typically contain artefacts of several types which show evidence of drilling: bone and shell one-piece fish hooks and tabs, stone reels, whale tooth pendants, sharks teeth and other amulets, some minnow lures and lure points, harpoon points, and tattooing chisels. Furthermore a wide range of wooden objects would have been drilled for suspension or lashing. It is clearly unwise, then, to assume at the outset that drill points on this or any other site were involved in the manufacture of only one-piece fish hooks. In this case 12 of the drills exceed the diameter of holes drilled in bone and shell tabs from local sites: indeed they fall into the range of the perforations in stone reels from Wairau Bar (Duff 1956:354-5).

The other measurement made on these drills, that of depth of gloss, cannot be directly related to the object being drilled. The reason is, of course, that when a hole was broken through to the corresponding unfinished hole drilled from the other side, the tip of the drill might pass right through beyond the tab, especially if the operator wished to enlarge the opening. This measurement when doubled indicates only the maximum thickness of material that a particular tip was used to drill.

The drill tips recovered from this site give the impression of having functioned in a relatively soft material such as wood, for they do not show enough wear for stone drilling nor any traces of bone powder in their cavities which might indicate drilling of bone. It is deduced that the holes that they made ranged from 5mm to 16mm diameter with three clusters apparent (Table 1): around 6mm (five tips), around 10 - 11mm (10 tips), and around 14mm (six tips). However, they cannot be interpreted as three different types of finished perforation, for it is a common practice when drilling a large hole to enlarge it to the desired diameter by using progressively larger drills. The smaller hole helps to centre the larger drill. In fact only one large 14mm hole might have been drilled with the three sizes of drills. There is already some evidence of different drills being used for the one operation in the form of the drill tips with lateral gloss but no tip wear, which were obviously brought into use once the hole had broken through. It can also be established that the holes drilled by these tips would have had sloping sides compared with the narrow, almost vertical-sided holes of the one-piece fish hook tabs. Beyond these conclusions the functional analysis cannot proceed at present except by indirect evidence. For example, the virtual absence of bone from the site, where soil acidity is low enough for bone to survive, could be used to support the view that some other relatively soft material was being worked, such as wood.

TABLE 1

TABLE OF DRILL DIAMETERS AND DEPTHS OF PENETRATION

Accession (All Layer 2)	Material	Diameter (mm)	Depth (mm)
XVIII/4	Chert	9	3
D.E.	Chert	10	7
XVIII/17	Chert	5	2
XVIII/17	Chert	11	5*
XVIII/8	Chert	14	11
XVIII/17	Chert	9	7
XVIII/7	Chert	10	9
XVIII/6	Chert	9	9
XVIII/7	Chert	7	5
XVIII/8	Chert	14	10
XVIII/7	Chert	6	6
XIX/21	Chert	7	12*
XVIII/12	Obisidian	12	11
D.E.	Obsidian	12	9*
XVIII/21	Siliceous limestone	16	19
XVIII/16	Argillite	9	8
D.E.	Argillite	6	5
XVIII/17	Argillite	14	10
XXII/2	Argillite	11	12
XVIII/13	Argillite	14	12*
XVIII/22	Argillite	14	16*
		Mean = 10.43	
		α = 3.17	

NB 1: D.E. = Double-ended, accession as above
NB 2: * = No tip damage

FLAKES

The bulk of the stone material is, as usual, flakes. It has recently become common practice to present figures for the numbers of utilised and waste flakes from site layers (Morwood 1974:83, 88, 90, 92; Leahy 1974:53-7). Leahy commented that waste material "occurs from the making of core tools", but this is unlikely to be the case for obsidian which is seldom, if ever, manufactured into adzes, drills or other core tools. Morwood also linked waste material with tool manufacture (Morwood 1974:82, 88, 92). In two sites he claimed that even the small number of "not necessarily used" flakes had probably been utilised but the wear was difficult to identify. A site with a high percentage of "unused" obsidian (Morwood 1974:92) was interpreted as a locality where "obsidian tools were being manufactured as well as used". Expressed as a ratio of used to unused, Morwood's obsidian flakes range from 1 : 0.13 to 1 : 1.28. In contrast, Leahy's study of Hot Water Beach produced an average ratio for imported Mayor Island obsidian of 1 : 2.22, with an overall site ratio for obsidian flakes of 1 : 3.29. This amount of variation between sites is difficult to explain without questioning the criteria employed to judge use. In the case of the Washpool Walls site, the obsidian assemblage was examined for edge modification by K. Prickett who looked at 222 items and noted 124 with edge damage and 98 apparently waste (Prickett 1975). The author also studied these 222 flakes plus 15 not seen by Prickett and found only 80 with significant edge damage and 157 without. At least 44 flakes had a minor amount of edge modification, the causes of which could not easily be determined – whether prehistoric use or subsequent handling or exposure to natural forces. As long as this degree of variation exists in judgments of use, ratios of used to unused flakes cannot be compared between authors, and any conclusions concerning the relative importance of the manufacture of obsidian tools on a site must be regarded as tentative.

Current views of stone flake utilisation among Pacific peoples stress the importance of "the selection of suitable edges fortuitously formed rather than the actual manufacture or modification of edges to suit the task in hand" (Jones 1972:66). The study of the stone flakes from this site adds support to this view, for in overall morphology there is no obvious preferred shape or method of manufacture, as there is in the blade industry of Murihiku, or the *mataa* of Easter Island. The assemblage is composed of small flakes struck from rather irregular shaped cores by low angle percussion. The sections of utilised edge, however, show much greater consistency and regularity in their characteristics.

The method of analysis involved the separation from the assemblage of all flakes and cores which showed a degree of edge modification beyond that which might be expected from excavation, cleaning, and transport with other stone materials. Four variables were recorded, essentially following Jones (1972). These were length of utilised edge section, whether the modification was unifacial or bifacial, whether the edge section was concave, straight or convex, and the effective edge angle (Jones 1972:93-4). These observations together with an examination of all surfaces of the flake for use striations were made with a low power binocular microscope (x10), and were confined to the chert and obsidian components where the quantity of flakes permitted useful statistical comparison.

Perhaps the most significant conclusion derives from the study of utilised edge section lengths. In obsidian these ranged from 3mm to 20mm and in chert from 3mm to 23mm. The mean length for edges on 49 green obsidian flakes was 8.25mm ($SD = 3.03$, $SE_{\bar{x}} = 0.303$, $n = 118$) and for 15 grey obsidian flakes 8.26mm ($SD = 4.21$, $SE_{\bar{x}} = 0.64$, $n = 43$). A t test conducted on these two groups indicated no significant difference ($p = .25$, $t = 0.01601$, degrees of freedom $= 141$) so it may be claimed that the tasks for which green and grey obsidian were used were probably identical, and further that the artisans did not distinguish between the two types of obsidian in terms of function. It might be argued that these results are to be expected since only one material is involved. What was not expected was that the chert component, consisting of 42 flakes of larger overall dimensions, some twice or three times the size of utilised obsidian flakes, should have a mean modified edge length of 8.20mm (SD = 3.61, $SE_{\bar{x}}$ = 0.37, n = 97) which was not significantly different from obsidian (p = .25, *t* = 0.10542, degrees of freedom = 195). In this case, therefore, two groups of flakes of different sizes and materials, proved to have identical edge modifications and presumably were both used for the same operation.

The majority of flakes had more than one modified edge: in the case of obsidian an average of 2.6 per flake and 2.3 for chert. This average may be used as some indication of the relative value of an imported material. Since obsidian was transported over a greater distance than the chert, it is not unexpected that it should have had more intensive use. The ratio of used to unused flakes echoes this, as obsidian has a value of 1 : 2.04 and chert 1 : 3.17 (both assessed by the author). It should be remembered, however, that this is only an *indirect* assessment of amount of use, since it recognises only two states, "used" or "not used". The edge count is preferable for it can distinguish range of use.

As Jones (1972:66) had indicated, it proved difficult to distinguish deliberate retouch from the flake scars resulting from use. A further complication was the presence of areas of crushing and multiple scars which could easily be mistaken for harsh use scars but for their contiguity with a striking platform and position on the opposite side from the bulb of percussion. This sort of damage was caused by a hammerstone before the flake was detached. It was found that most of the low angle edges had been used without any attempt at retouch and had suffered damage in the form of "bites" irregularly spaced along the edge. With higher edge angles (>45°) the problem of detecting retouch became critical (Jones 1972:130). Indeed the technique of retouch may have been identical with the actual work operation performed, that is, pressing the flake edge against a hard surface. In this case the archaeologist cannot readily determine whether the hard surface belonged to a tool for retouching or the object being worked. There is some evidence to suggest the latter. On several flakes of both obsidian and chert all the sections of modified edge had identical characteristics of edge length or diameter of concavity, type of edge and effective edge angle, indicative of *use* on the same task. Of course this is most apparent where the type of use has produced notches or indentations, an observation also made by Jones (1972:132). One may infer that the various notches were the end product of scraping one or more shafts of the same size. The size of the shaft is indicated by the diameter of the notch. In this site 20 obsidian edges were of this type and with the exception of two edges, all fell within the range 5 - 9mm, a comparable shaft size to a modern pencil. In chert, 18 of the 21 notched edges were 9mm or less. The notched edges amounted to 13% of the obsidian and 27% of the chert edges. All were unifacially modified with a high effective edge angle often greater than 70°.

It has been argued by Jones (1972:132) that such configurations of notches "suggest that what is being measured as the features of a unifacially altered edge are the terminal stages of usage when the edge has become too blunt for further use". If the edges were employed scraping a circular shaft until indentations were formed by unintentional "pressure" flaking, then the resulting effective edge angle should be able to be used as an index of bluntness, that is to say, the higher the angle, the blunter the edge. In this site, therefore, the high edge angles of what might at first be identified as spokeshaves would indicate that the notched flake was a by-product of shaft scraping, not an intentional tool type.

As with the majority of flake collections from New Zealand sites (Jones 1972:148), unifacially modified edges are well represented. In his study Jones found that the relative proportion of the two edge-alteration states, unifacial and bifacial, was 50%, while White (1969) established that for Highland New Guinea assemblages unifacial alteration (referred to as "chattering") amounted to 80%. In the obsidian component from the Washpool Walls site 85% of edges were unifacially modified and in chert 93%, a situation which White and Jones would interpret as a concentration on scraping.

The 15% bifacially modified obsidian edges had a number of characteristics in common: the presence of marked crushing on both surfaces, straight edges, effective edge angles of 40 - 60°, and very similar edge lengths (range 3 - 8mm, average 5.3mm). This consistency of features suggests a discrete task was being performed by the edges, of a different nature to the scraping carried out with the high angle unifacial edges. Judging from the degree of crushing and the short edge length the task may have involved incising or chiselling away unwanted material in a confined space, such as an angled adze helve or bird lure.

Striation analysis has been recognised as a useful method of determining function since the pioneer studies of Semenov (1964). Without special treatment, the traces of wear are invisible on most materials such as chert, but are particularly clear on obsidian. However if the obsidian collection is derived from a sandy matrix and has been used in sandy conditions, edges, surfaces, and flake scar intersections invariably display pitting and scratching which may prove difficult to interpret. The utilised obsidian edges from this site are disfigured to such an extent that only 28 edges have adjacent striations which can be unquestionably related to their functioning. Only four of the 28 possess striations running parallel to the edge, a type of wear which results from a to-and-fro sawing action. In three of these cases the edge angle is unusually low (c.20°). With such a thin edge the material being cut must have been fairly soft and the striations caused by sand or broken-off obsidian particles dragged along the edge. Of the remaining 23 edges with associated striations, all but two have an effective edge angle of 45° or greater, all are unifacially flaked and the striations are on the unflaked sides, running at right angles to the edges. This may be interpreted as evidence of unidirectional scraping: as the edge was drawn towards the body the smooth surface facing into the material became scratched by any particles adhering to it and small flakes were detached from the opposite or trailing edge surface. If the edge was pushed away from the body at the same angle the flakes would come off the trailing edge on the same surface as the striations. Only the former type of wear is recognisable in this collection. The 24 edges which show right-angled striations belong to a much larger class of unifacial edges which are usually unstriated and have medium to steep effective edge angles (>50°). Assuming that the unmarked edges were employed in similar tasks to those which received scratches, this suggests that in most cases actual working conditions were relatively grit-free.

Striations are not visible on the chert flakes but nine long, low-angle edges show a type of edge damage indicative of sideways drag or "sawing". These modified edges are all above 12mm in length and no comparable forms exist in the obsidian collection. It should be noted that the majority of long edges on the larger obsidian flakes have discontinuous edge wear sometimes at two or three locations on the one edge, a situation which suggests that the objects being scraped were narrow and thin. Jones (1972:133) would interpret this as evidence of "use of the edge of the manufacture of rectangular section artefacts".

OTHER TOOLS

The other tools found in Layer 2 have been provisionally identified as three attrition saws, a possible hammerstone, a burnisher, two grindstones and a schist file. The saws were originally flakes struck from waterworn greywacke stones, on which one or two edges have been utilised in a to-and-fro sawing operation on a hard abrasive material, almost certainly stone. Likewise the burnisher and grindstones show wear consistent with use on stone. The small schist file (4.6 x 0.9mm) would have been used on some delicate task on bone or more probably stone, and shows considerable wear at the working end. It has been noted earlier that the only manufactured stone object in this site apart from the stone tools is the broken, unfinished, schist minnow lure. Although these stone-working tools could have been used in minnow lure manufacture it must not be forgotten that the unfinished lure might have been brought to the site, like the argillite adze pieces, as a source of raw material. Whatever stone working was carried out here, one can only establish from these tools that small items were being processed.

CONCLUSIONS

In summary, detailed analysis of stone flakes from this site has shown that it is possible to identify the following usages:

- scraping narrow (<10mm), flat or circular surfaces, in a relatively soft, grit-free material like wood (the majority of obsidian and chert flakes were apparently put to this use),
- cutting or slicing soft materials like green wood (a few obsidian edges were used in this way),
- sawing somewhat tougher material (a few chert edges were involved),
- incising or chiselling in a confined groove (only obsidian flakes were used).

It has also been suggested that the drill points were employed making fairly large perforations in wood, while a few cutters and other tools indicate manufacture of one or more small stone items. Perhaps the most noticeable aspect of this assemblage is the lack of "breaking down" tools, for example large rough cutters, saws or adzes. The emphasis appears to be chiefly on the finishing of small wooden objects which may have been perforated. Such objects would have been brought to this spot together with the finishing tools.

Finally, the discovery that for the scraping tasks chert and obsidian flakes were functionally interchangeable, but that as a material obsidian was more highly valued, demonstrates that by close analysis of industrial assemblages some light can be thrown on the value systems of prehistoric workmen.

Note

1. In the following discussion the term *polish* refers to the deliberate creation of a smooth surface by abrasion with fine sandstone or similar material. *Gloss* is acquired as a result of use, especially in contact with silica-rich materials. *Crushing* is characterised by tiny step fractures and cracks marking incomplete fractures.

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