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Plane-rasps: a Knapp Tool Type Re-identified from a Nelson Classic Maori Site

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ABSTRACT

Although the majority of stone tools in a recent collection of 43 items, made at the Appleby Site in Nelson, appeared on first impression to be adzes, adze fragments or adze preforms, a closer examination showed that 7 flake tools and 4 reworked adzes had 2 features not present on adzes. These are very steep retouch on the dorsal surface at the distal (working) end and a distinctive gloss on high points of the bulbar surface, on the opposite side from the surface which develops haft polish in an adze. It is proposed on the basis of low-power microscopic analysis of these features and an experimental trial, that these tools were used in a planing-rasping mode, a function first suggested by F. V. Knapp nearly 70 years ago, but subsequently ignored by New Zealand archaeologists.

Keywords: FLAKE TOOLS, FUNCTION, EXPERIMENTAL TRIAL, CLASSIC MAORI, NELSON.

INTRODUCTION

The amateur ethnologist Frederick Vincent Knapp (1863–1945) is more often remembered today as a classifier of unpolished Maori stone tools who showed a marked propensity for typological 'splitting', than as a field archaeologist of the Nelson area who documented the exposure and destruction of the area's rich prehistoric sites as agricultural development accelerated in the late nineteenth and early twentieth centuries. As Butts (1980) has noted, Knapp's publications in the *Journal of the Polynesian Society* were mainly concerned with analysis of the extensive artefact collections he made in the course of his fieldwork. They seem to have been predicated on a belief that Maori craftsmen involved in specialist woodworking such as canoe manufacture would have required tools capable of performing the same functions as European woodworking tools. On this basis Knapp set up numerous categories of stone tools that matched the functional names of the European types, such as routers, boring tips, flat push-planes, saws, scrapers, rimers and gravers. He argued that there were about "12 to 15 sets of definitely shaped tools—the remainder being trimmed flakes used for specific purposes" (Knapp 1924: 113). Because stone tools exhibited far more variability than steel tools, Knapp came to the conclusion that Maori had sometimes combined functions within a single artefact. This resulted in the recognition of some 53 types of flake tools, a typology that was to prove too cumbersome for other ethnologists to apply (Shawcross 1964: 10). Knapp's types sank into obscurity, although the illustrations

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in his papers leave us in no doubt that he had a keen eye for evidence of retouch and use-wear.

Given the deficiencies of Knapp's typology, the opportunity to examine a recent collection of 43 stone tools from one of the sites on which Knapp collected did not encourage me to revive his types, nor at first to re-read his papers. A decision was made to examine the tools morphologically for evidence of the technology of manufacture, and for traces of use-wear, proceeding from there to assess function on the basis of this evidence alone. A third step, an experimental trial of one of the functional categories, was subsequently added. Only then was Knapp's work reviewed.

THE APPLEBY SITE, WAIMEA (S20/1; N27/118)

The site referred to as Appleby, at Waimea West on the Waimea Plains, was already well known among Nelson archaeologists and collectors when Rigg and Bruce published their account of the made soils of the Waimea area in 1923. Knapp described it as "the old inland pa site at Appleby" (1928: 114) and "the main pa of this area" (1929: 27). He included material recovered from it in several of his papers (e.g., Knapp 1928, 1929), and wrote

> The fact that hundreds of adzes, chisels, and other implements have been picked up on the site of the main pa of this area seems to point to a large population in past days. (Knapp 1929: 27)

Covering an area of 0.3–0.4 ha close to the Waimea River, the Appleby site lies within a zone of fertile alluvial soils now subject to intensive horticultural use. During the course of establishing a boysenberry orchard and in subsequent cultivation and fencing operations, the owners of the property, G. and P. Wilkinson, have recovered numerous artefacts. Excavations were carried out on the site by Ian Barber in 1989 (Barber n.d.). The dates obtained from charcoal samples from adjacent borrow pits (Barber, n.d.; Challis 1991: 130) confirmed earlier conclusions based on artefact styles that the site was Classic Maori.

DESCRIPTION OF THE COLLECTION

On first impression, the Wilkinson collection appears to consist of adzes and adze fragments: of the 43 items studied, only a small, highly polished, natural pebble (a possible burnisher, see Knapp 1938) lacks the features normally associated with adzes or chisels, namely two faces converging asymmetrically to form a cutting edge and, in most cases, evidence of hammer dressing and polishing of the surfaces adjacent to the cutting edge. With the exception of the natural pebble and three nephritic artefacts, the remaining items were of metamorphosed argillite or basalt from a number of sources. Both of these materials were commonly used in adze manufacture. Of the 14 artefacts still showing traces of the original surface, 7 display weathered cortex and 7 are waterworn. The latter were probably selected from the bed of the Waimea River, a major tributary of which drains a portion of the Nelson Ultramafic Belt with which the metamorphosed argillites are associated (Johnston 1987: Fig. 1). The artefacts with weathered cortex are equally varied in colour and texture and also appear to be derived from a variety of sources.

For eight of the items in this collection (Fig. 1), adze status is not in doubt. All have asymmetrical profiles with polished front and back in the vicinity of the cutting edge, and bevel angles falling in the approximate range of 40–60° (Fig. 2). Of the complete adzes, three show friction gloss on the adze back above the bevel, of the type sometimes referred to as 'haft polish'. If correctly identified, the presence of this polish indicates that the stone blade had been hafted and used with the adze back rubbing directly against the sole of the helve or against a fibrous packing or wrapping such as bark.

Four artefacts could be described as adze preforms. They had been formed on flakes, had suitable bevel angles and, in two cases, had been subject to some preliminary hammer dressing. One possible preform fragment was identified. Another ten items are pieces of adzes which have suffered transverse fractures. All show faces prepared by grinding and/or hammer dressing and cross-sections typical of the complete adzes in the collection (reverse plano-convex or reverse trapezoidal—Emory 1968: 152). Following the transverse fracture, no obvious modification of these pieces had occurred.

Another group of adze fragments had been modified after transverse fracturing. This modification took the form of flake removal using the fracture surface as striking platform and/or a re-flaking of the former cutting edge, often at a very steep angle. Four modified flake adze fragments possessed an additional feature: the presence of what appeared to be a friction gloss on the bulbar surface which had been the front of the former adze. In three of these four cases the gloss was superimposed on patches of polish (grinding), but was distinguishable under a low powered microscope. The areas of friction gloss showed a loss of surface detail and the presence of uneven scratches often lying at different angles to the close even scratches left by the grindstone. This friction gloss was similar to haft polish except for its association with irregular scratches and its presence on what had been the front of the former adze, not the back.

Seven other flakes displayed gloss patches on their bulbar surfaces (six are illustrated in Fig. 3). In plan they could easily pass for adze preforms, as flakes have been trimmed from their dorsal surfaces in order to transform them into elongated tools with sides tapering to an untrimmed 'butt' and with a 'cutting edge' at the opposite end. In profile, however, it is obvious that these modified flakes could never have functioned as adzes because of the steep angle of the 'bevel'(Fig. 4). This should not be considered a mistake made by the adze maker, because the high angle in each case results from steep, deliberate retouch. Coupled with the evidence of use, the absence of any signs of grinding, and only minimal hammer dressing (on only three of the seven items), it is quite clear that these flakes were trimmed and used for a specific purpose which was not adzing. Furthermore, the four pieces from broken adzes (discussed above) were modified and used apparently in the same way.

MICROWEAR EVIDENCE

Close examination of the gloss on the bulbar surface of these seven flakes and four re-used adze pieces shows that it formed on all high points from the 'cutting edge' to the butt end of the tool (Fig. 5). It was not present in the slightly concave zones adjacent to the original bulb of percussion. While most marked on the lower half of the bulbar surface adjacent to the steeply retouched end, it also occurred on high points at the opposite end. This indicates that the bulbar face of the tool acquired its gloss by moving over a relatively flat surface while oriented parallel to that surface—not at an angle, as in the case of an adze or chisel. For the gloss to form so close to the butt, no wrap-around handle (comparable to an adze

Figure 1: Front (upper) and side (lower) views of eight adzes from the Wilkinson collection.

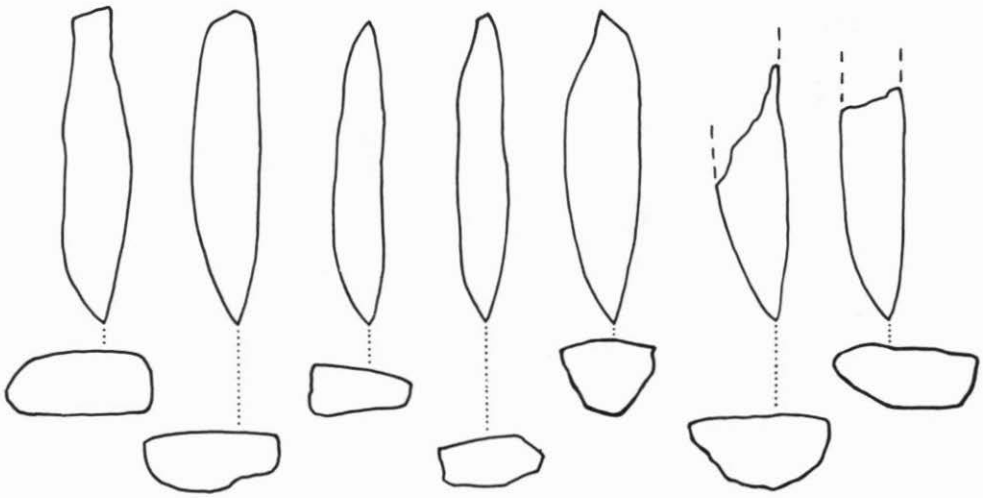

Figure 2: Profiles and cross-sections of seven adzes from the Wilkinson collection showing longitudinal asymmetry and bevel angles of 40–60°.

or chisel haft) could have been present, although it is possible that the opposite face of the tool could have been set into a hollowed out block or fibrous wad for more comfortable operation.

The scratches that cut across the patches of gloss differ from the marks left by conventional grinding in their irregular occurrence and variable width. Although they lack the close parallel appearance of grinding striations, they are not randomly oriented, but show a tendency to run up from the working edge a few degrees to the left of the longitudinal axis of the tool. This trait is evident on 6 of the 11 artefacts. It suggests that the gloss was formed by pushing the tools across the working surface with the front right corner of the bulbar face (in the vicinity of the steep retouch) forming the leading edge.

A very simple explanation can be offered for this evidence. Because of the comparative shortness of the thumb, the human hand finds it more comfortable to operate a tool in push-pull mode by tilting the axis of the tool slightly to the left of the direction of forward motion in the case of a right-handed operator, or to the right if the operator is left-handed. Any hard particle trapped between the two surfaces will therefore produce a scratch on the bulbar face which runs some degrees to the left of the longitudinal axis if the operator is right-handed, and to the right in the case of the left-handed artisan. These particular Appleby tools were therefore used in a push (and probably pull) mode by right-handed operators.

The similarity of the friction gloss on these tools to the haft polish on adzes suggests that the contact which produced the gloss was with wood. Wood polish on flint was the subject of extensive research by Keeley (1980) who found that a distinctively bright and smooth-textured polish was formed during wood-working experiments "regardless of whether the wood was a hardwood or softwood species, fresh or seasoned, and regardless

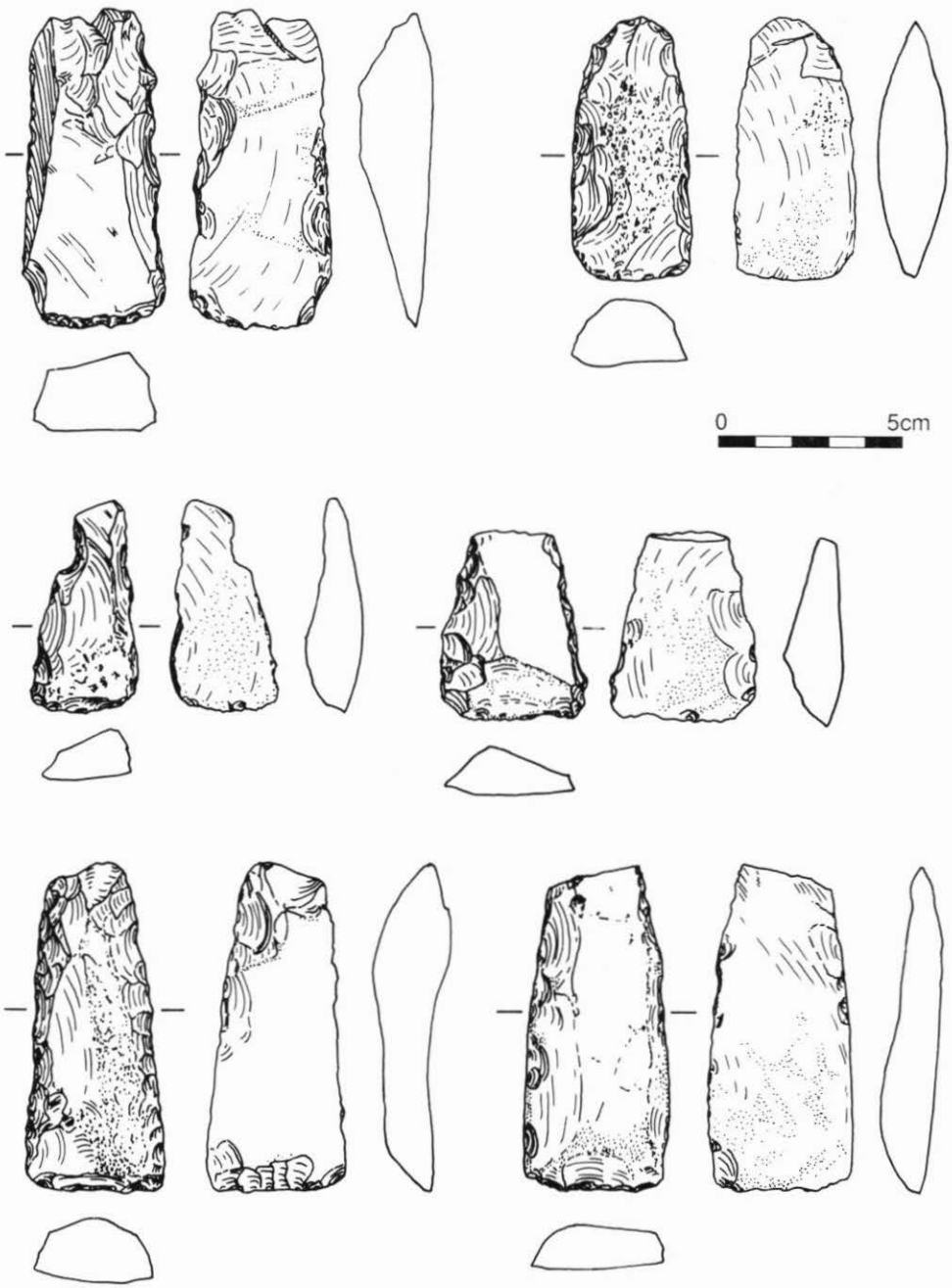

Figure 3: Six flake tools from the Wilkinson collection with steep-angled (>60°) 'cutting edges' and gloss patches on bulbar surfaces (gloss shown by stippling).

Figure 4: Bulbar (upper) and side (lower) views of flake tools drawn for Figure 3, plus an additional example (lower rows, far right). Note steep angle of 'cutting edges' compared with adzes in Figure 1.

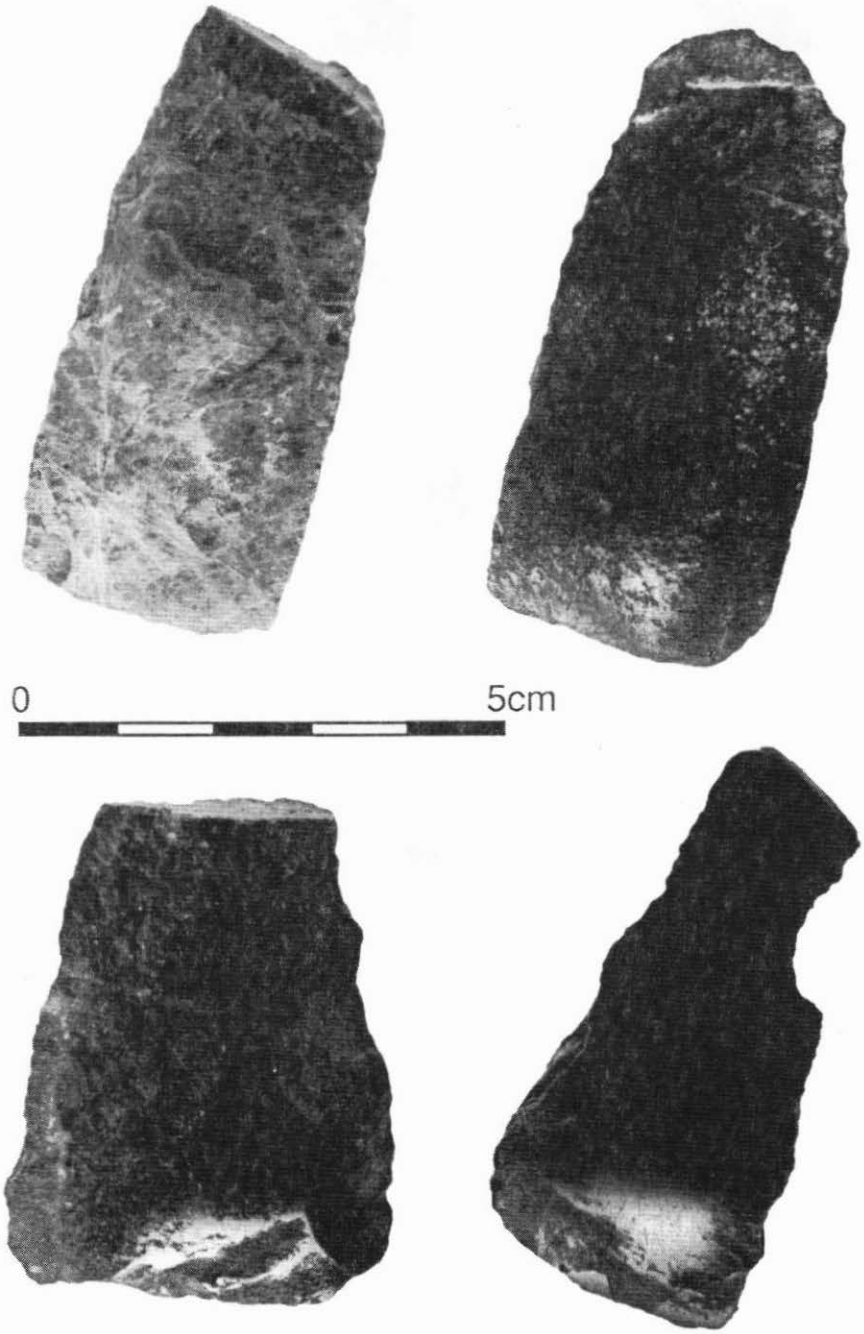

Figure 5: Close-up photographs of gloss patches on bulbar surfaces of four of the flake tools illustrated in Figures 3 and 4.

of the manner of use" (1980: 35). He also noted that the irregular broad and shallow striations were found only on tools used in wood working. Of the 59 wood-working experiments that he conducted, Keeley dedicated 20 to whittling/planing, 7 to sawing, 14 to scraping, 8 to chopping/adzing (without hafting), 3 to wedging, 4 to boring, and 3 to graving. The wear traces produced by whittling/planing included wood polish predominantly on the contact aspect of the tool, and striations on the contact surface indicating direction of use between 45° and 90° to the working edge. All the other functions produced wood polish on both aspects except for adzing with a hand-held flake. However, in the latter tool the polish was only weakly developed and the striations occurred some distance back from the edge instead of at or leading from the edge as in the case of planes. Thus, following Keeley's experimental results, the Appleby tools could be described as planes, a conclusion fully consistent with my independent observations of their use in a flat, push-pull mode.

EXPERIMENTAL TRIAL

It remained to check whether metamorphosed argillite would develop wear traces during planing similar to those formed on flint, and whether planing would reproduce the pattern of wear observed on the Appleby tools. One unused elongated flake (GV690) of Mt Ears argillite (D'Urville Island) was selected from the geological sample collection held at the Anthropology Department, University of Otago. The working edge was steepened, straightened and strengthened by retouch on to the dorsal surface, while the bulbar surface

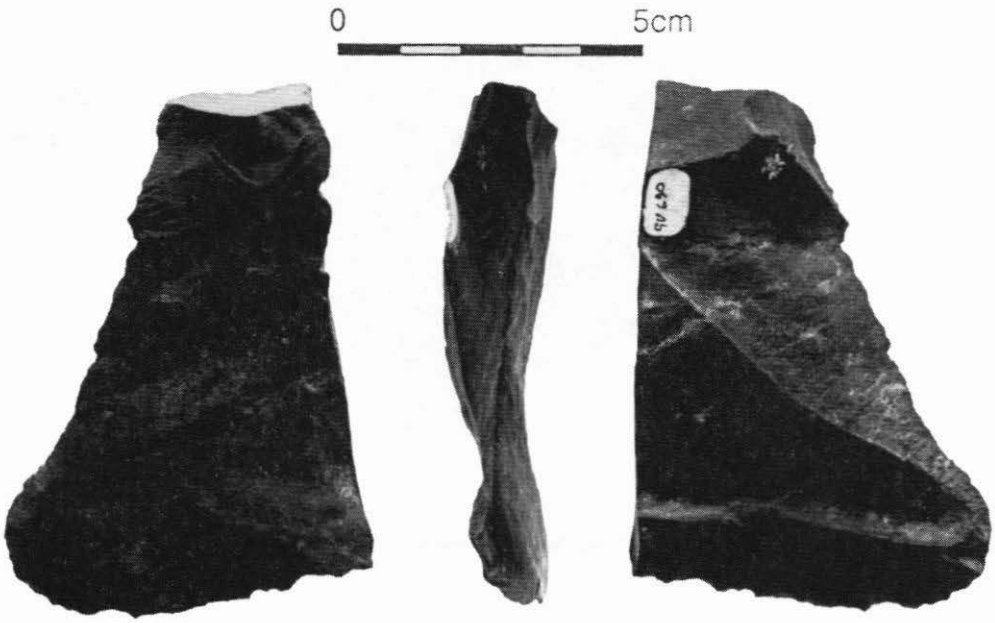

Figure 6: Bulbar, side and dorsal views of experimental metamorphosed argillite tool.

was left unmodified (Fig. 6). A large branch of partly seasoned crack willow (*Salix fragilis*) was then adzed with a steel adze blade in such a way as to leave low ridges between the shallow dished scars left by the wood chips. The argillite flake was then used to remove these ridges by moving it across them diagonally with a push-pull motion, and with the high points of the bulbar surface in contact with the wood. It was found that approximately 45° was the most efficient angle of orientation between the adze chip ridges and the working edge of the tool.

After 15 minutes a friction gloss had built up on all the high points of the sole of the plane (i.e., the bulbar surface), from the working edge to the edge of the striking platform remnant which formed the butt (Fig. 7). A brown stain was visible in the vicinity of the patches of wood polish. Under low power magnification (x40) it was found to be composed of wood particles lying in the interstices of the rock surface. As the gloss built up, the tool removed progressively less material from the willow. With no way of refurbishing the bulbar surface by removal of the gloss, it was clear that such planes would have needed frequent replacement. Viewed under the microscope, the gloss was seen to be broken in a few locations by shallow striations running a few degrees to the left of the longitudinal axis. The operator, as might be expected from this orientation, is right-handed.

Slight gloss formed on the ridges of the dorsal surface where the tool made contact with the nylon glove worn during the experiment. On the Appleby planes a similar pattern of dorsal ridge gloss was observed, suggesting that the operator used some sort of protective pad between his/her hand and the tool. The presence of small patches of hammer dressing on the high points of four of the planes indicates that other means of minimising discomfort from the sharp ridges were also found.

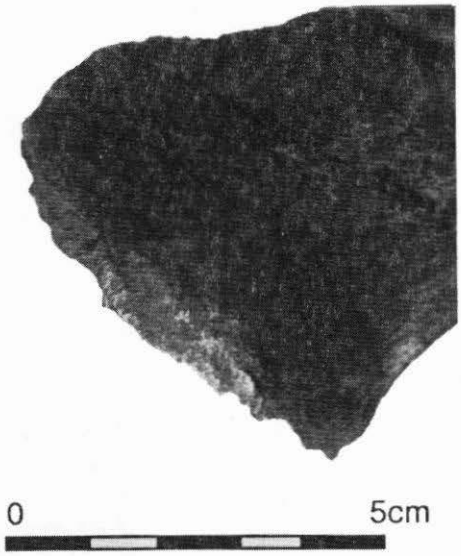

Figure 7: Close-up photograph of bulbar surface of experimental tool after use as a 'plane-rasp'.

For a second trial, a flake of metamorphosed argillite was struck from a portion of a river-rolled boulder originally obtained from the Upper Motueka River. Again, the working edge area was retouched before using the flake, bulbar face down, as a plane. It was clear from the start of the trial that compared with the first flake more marked curvature of the bulb had in some way rendered the tool less efficient, despite the sharp working edge. After eight minutes of planing, gloss had appeared at only two high points on the bulbar surface and much less wood had been removed than after the same interval in the first experiment. This result suggests that the leading edge is not the only 'working' portion of the tool. In the case of the steel plane, it is the cutting edge which works, with the bevel contributing strength to the edge and serving as a means of clearing the shavings. In stone planes, however, while the cutting edge severs projecting wood fibres, the rough texture of the bulbar face behind it appears to act as a rasp, smoothing the freshly cut surface of the wood and developing wood polish in the process. In the second trial, there was insufficient bulbar surface in contact with the wood for this rasping action to occur.

EARLIER RECOGNITION

When the existence of these plane-rasps had been recognised in the Classic Maori tool kit used at this site, the question arose whether F. V. Knapp collected any similar tools at this or other Nelson sites, and whether he recognised the form as a distinct tool type. Although Knapp described one type (Type 10) as a "flat push plane" (Knapp 1924: 105, 109), it was his Type 21, "push planes or scrapers with steep bevel cutting or scraping edge" (ibid.: 110), that most closely resembles the Appleby specimens. Unfortunately, he did not make any comment about the appearance of the bulbar surfaces of these tools nor the provenance of the figured examples. In view of his collecting history, it is not surprising that these planes have now been identified in his collections from other Nelson sites (Barber pers. comm.). They have also been recognised by Barber (n.d.) in the Rotokura assemblage. Clearly any claim that the plane-rasp is a newly identified tool type needs some qualification. It appears that Knapp was aware of its function nearly 70 years ago. Sadly, his presentation of the evidence was insufficiently clear to convince his colleagues of the validity of most of his types. With better facilities for photo-microscopy, modern researchers might benefit from a re-examination of the Classic Maori tool kit in all its diversity.

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