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New records and an analysis of the side-hafted adze from New Zealand

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ABSTRACT

Sixty-four new records of the side-hafted adze in New Zealand, not previously recorded in formal publication, are presented. The additional records for the North Island (31) are particularly important in view of the very few specimens formerly known. All recorded specimens are listed.

The side-hafted adze has a remarkable coastal distribution, reflecting the nature of Archaic period settlement and probable association with canoe-building. Five main rock types were used in manufacture of the adzes but only two, Nelson-D'Urville Island metasomatised argillite and Tahanga Basalt, are common. The adze type is shown to have been present from the 11th to 16th centuries.

The typology, use and antiquity of this specialised artefact are discussed.

Keywords NEW ZEALAND, ARCHAIC PERIOD, ADZE, STONE, SIDE-HAFTED.

INTRODUCTION

DEFINITION AND HISTORICAL PERSPECTIVE

The side-hafted or laterally-hafted adze, generally referred to as "Type 5" in the widely used adze classification system developed by Duff (1950, 1956, 1959, 1977) for Polynesian adzes, is regarded as one of the most specialised types used by New Zealand's early Eastern Polynesian inhabitants. In form it is essentially a quadrangular adze that has been rotated 90° so that the blade and cutting edge lie in a vertical plane in line with the haft, like that of a conventional axe (Fig. 1). The adze is frequently reduced on the narrow anterior surface to provide a distinct tang to facilitate secure lashing. The blade bevel may be either on the right or left side of the adze, but right-sided bevels are dominant, probably consistent with use by right-handed craftsmen (Duff 1939: 251; 1977: 184). It is the only Polynesian adze type known to demonstrate this characteristic.

The side-hafted adze was obviously developed from the conventional, tanged, early Eastern Polynesian, quadrangular adze (probably from the Type 1A, though it also bears a cross-section relationship to the Type 4 adze) to provide a specialised tool that could be used for lateral or side trimming of timber, particularly in the confines of a hollowed log being adzed into a canoe. In such work it would not be possible to use a normal adze, and thus the use of the side-hafted adze is generally considered to be mainly related to canoe building, and for dressing rather than hewing timber. Elsewhere in Polynesia (e.g. Hawaii and Society Islands), in Micronesia, and parts of Melanesia this problem of longitudinal side cutting of timber (as found in canoe hollowing) was overcome differently by hafting an adze in a special sleeve which could allow the adze to be rotated axially from a horizontal to a vertical position on the same haft.

The recognition of the side-hafted adze in New Zealand can probably be attributed to Best (1912: 136-52). He recorded traditional information relating to a special artefact – *toki titaha* – which he deduced as being a stone axe, hafted with the cutting edge in line with the handle. However, no examples were known. Later Best (1920) figured a stone adze axially hafted in an unconventional haft, stylistically carved with rectilinear patterns. This was a peculiar but "symbolic artefact" of post-European origin obtained from Parihaka, and was illustrated by Best as the only example he had found of an adze hafted in the apparently traditional style of the *toki titaha*.

Skinner was the first to describe a side-hafted adze as an artefact which could have only been hafted and used with the blade and cutting edge in a vertical position, although initially he called it an "axe" (Skinner 1919; Skinner *in* Duff 1950, p. vi). This specimen in the British Museum described by Skinner (1919) was most probably the adze originally figured by Edge-Partington (1890-8, Vol. 2: 233, Fig. 1). With Skinner's record available to document the existence of this previously unknown artefact type, Best's (1912) earlier traditional references to the *toki titaha* were able to be placed in proper perspective (Duff 1939), as references to the side-hafted adze. Skinner (1938, 1943, 1974) recognised further examples of the side-hafted adze from Murihiku and classed them as Type 10 in his classification of South Island adzes. Duff (1940, 1942) modified Skinner's classification but did not formally designate the adze type as his Type 5 until 1945 (Duff 1945); a classification category which he further expanded with subtypes to include Eastern Polynesian forms (Duff 1950, 1959, 1977) as they became recognised. In Duff's present classification system, New Zealand specimens of the side-hafted adze form a uniformly distinct sub-class, that of Type 5A.

Beyond New Zealand, examples of laterally-hafted adzes, differing slightly from the New Zealand style, have been recorded from Eastern Polynesia. Tanged and more elongate specimens are known from Pitcairn Island (Emory 1928; Figueroa and Sanchez 1965, Fig. 61) and along with a few possibly similar examples found in the Society and Tubuai Islands (Emory 1928, pl. 5, Fig. c; Duff 1950: 195; 1959: 141; Figueroa and Sanchez 1965: 199) are regarded as Type 5C. An untanged bilaterally bevelled wedge-like form recorded from Mangareva is designated as Sub-type 5B by Duff (1950, 1956, 1959, 1977), and this form would also appear to be present on Pitcairn (Figueroa and Sanchez 1965). The scattered distribution of this specialised adze type in Eastern Polynesia was originally explained by the "age area" hypothesis of geographical distribution (Duff 1959: 127). Earliest forms were believed to survive as relict types at the periphery of distribution, having the widest geographic range, i.e. Pitcairn, Tubuai, New Zealand, whereas at the centre of distribution new forms developed, replacing the earlier styles.

The earlier ancestry of the side-hafted adze in Polynesia is not well known but the type is believed to have diffused through the Society Islands. From excavations at Maupiti (dated c. A.D. 850) which have demonstrated a similar material culture to that found at the early Wairau Bar site in New Zealand (c. A.D. 1150) (Emory and Sinoto 1964), it is inferred that the Society Islands were one of the important sources from which New Zealand's early multi-origined culture (Green 1966; Bellwood 1970) was derived. The absence however of adzes with marked development of tang or shouldered grip from the Maupiti excavations indicates that New Zealand Archaic culture was possibly derived from a later (*post* Maupiti) phase of Society Island culture (Emory and Sinoto 1964) when adze technology was marked by a major development of more characteristically "Classic", gripped adzes which included the side-hafted form (Duff 1968). Diffusion of this adze type to Pitcairn and Tubuai may have also taken place at this stage, once the artefact style was established within the Society Group. It should be mentioned, however, that the Marquesas Islands are regarded as an equally important centre for Eastern Polynesian cultural dispersal (Sinoto 1967, 1968, 1970; Bellwood 1970). So far no examples of the side-hafted adze have been recorded from this region but should they

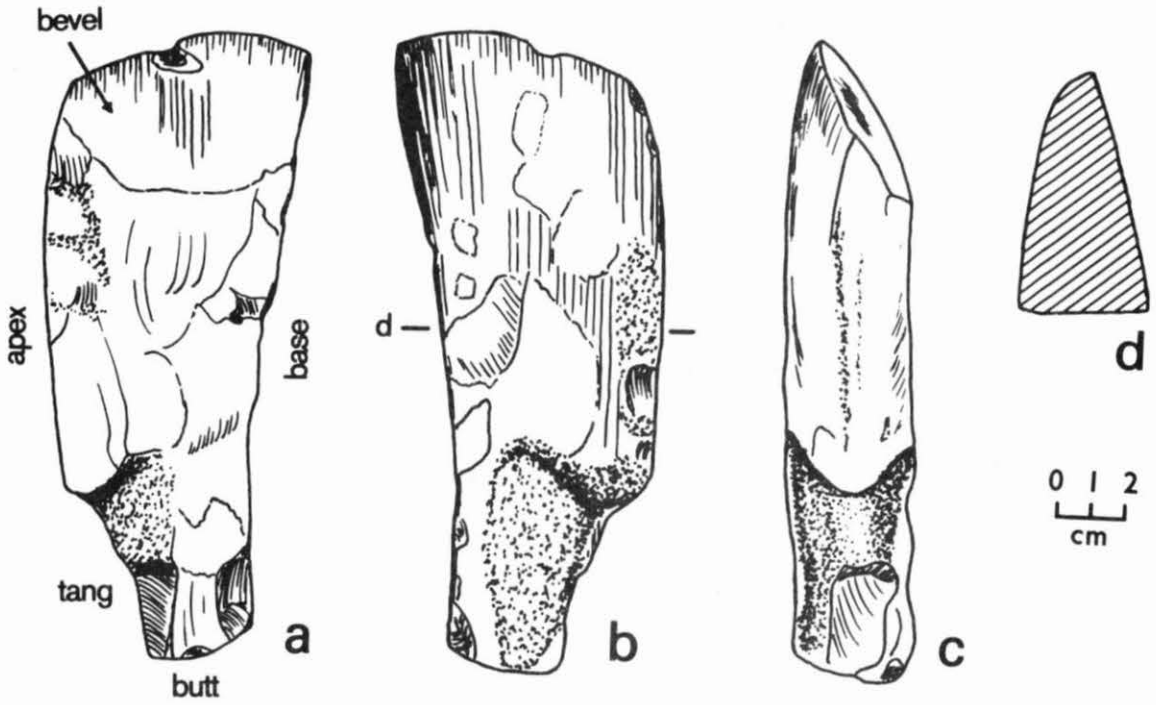

Figure 1 Example of the New Zealand side-hafted (Type 5A) stone adze. National Museum specimen ME 5701, from Clutha River mouth (see Table 1, specimen No. 88). A. Right lateral view (with right sided blade bevel). B. Left lateral aspect. C. Anterior view. D. Cross section.

be discovered in early sites then the Marquesas could take precedence over the Society Islands as being the initial dispersal area for the adze type.

USE WITHIN NEW ZEALAND

Within New Zealand the side-hafted adze has always been regarded as an early artefact type, being part of the basic tool kit of New Zealand's early Eastern Polynesian culture. Duff (1942) notes that its distribution is similar to that of the Type 1A adze, as would be expected for an Archaic artefact. Certainly to judge from the use of Nelson-D'Urville Island metasomatised argillite for many South Island specimens (Duff 1977) and the association of this adze type with other Archaic artefact types in early sites, the side-hafted adze has had a long history within New Zealand culture. In itself the side-hafted adze is regarded as being one of the "key fossils" to the Archaic period of prehistory (Duff 1950; Golson 1959). The later history of the adze is not well known and the upper limits of its time distribution cannot be easily defined. In some areas of the North Island but particularly in the South Island, Archaic material culture existed until relatively late, so use of this artefact type may have continued amongst people not totally committed to Classic culture, hence the references recorded by Best (1912). It is certain that this artefact was never part of Classic Maori material culture; it has never been recovered from Classic sites or found in collections associated with Classic-style adzes.

The recovery of numerous side-hafted adzes may reflect an important early period of canoe construction connected with intense maritime coastal exploration (Simmons 1969) and predominantly coastal settlement (Fig. 2). The continued use of the side-cutting adze in New Zealand's Archaic culture was not only likely to have been a matter of tradition but also of need, as it was undoubtedly an effective "canoe artisan's tool". From a technological view-point however it could be speculated that early canoe hull design may have favoured deep narrow hulls where the need for a specialised side-cutting tool for internal side trimming was fundamental. The early European explorers of the initial contact period remarked on the great diversity in South Island canoe form. Single, double and outrigger canoes are on record (Orchiston 1974, Section 1) but all were narrow-hulled vessels without top strakes. Few surviving "early" canoe hulls are known, but two examples are the Henley and Te Horo hulls (Barrow and Keyes 1966: 283, see Figs c, d, for cross sections). These hulls would have required the internal sides to be trimmed with laterally-hafted adzes. Also, to these records can be added the remains of outrigger canoe floats, which further indicate the use of narrow-hulled canoes in the past.

With the rise of Classic Maori culture in the North Island came a technological and cultural change of major importance in New Zealand prehistory. With this culture came the abandonment of the traditional range of specialised, early Eastern Polynesian adze types, as well as culture traits of the Archaic, and the development of a locally produced, simplified, general purpose adze, the Type 2B, as the standard adze of the Classic Maori. The "initiation" of Classic culture, apart from any external influences, may possibly have been due to population pressures in coastal areas forcing settlement to move inland. The result of such population movements, expressed in terms of adze technology, is likely to have been that traditional stone sources and trade in traditional artefact types would have become restricted, and locally-produced adzes made from immediately available stone resources would have become general.

The change in adze technology in the Classic culture removed the side-hafted adze as a basic tool in canoe construction, but the loss of this artefact did not obviously impede canoe building. The need for an effective "substitute" artefact capable of trimming vertical timber in the confines of a canoe hull was likely to have been fulfilled by the use of Type 2B adzes fitted into "composite hafts" (Keyes 1973). Such hafting, giving an extended cutting blade and a short, curved handle, would allow vertical timber adzing to be carried out in moderately confined spaces. It becomes obvious, however, that a

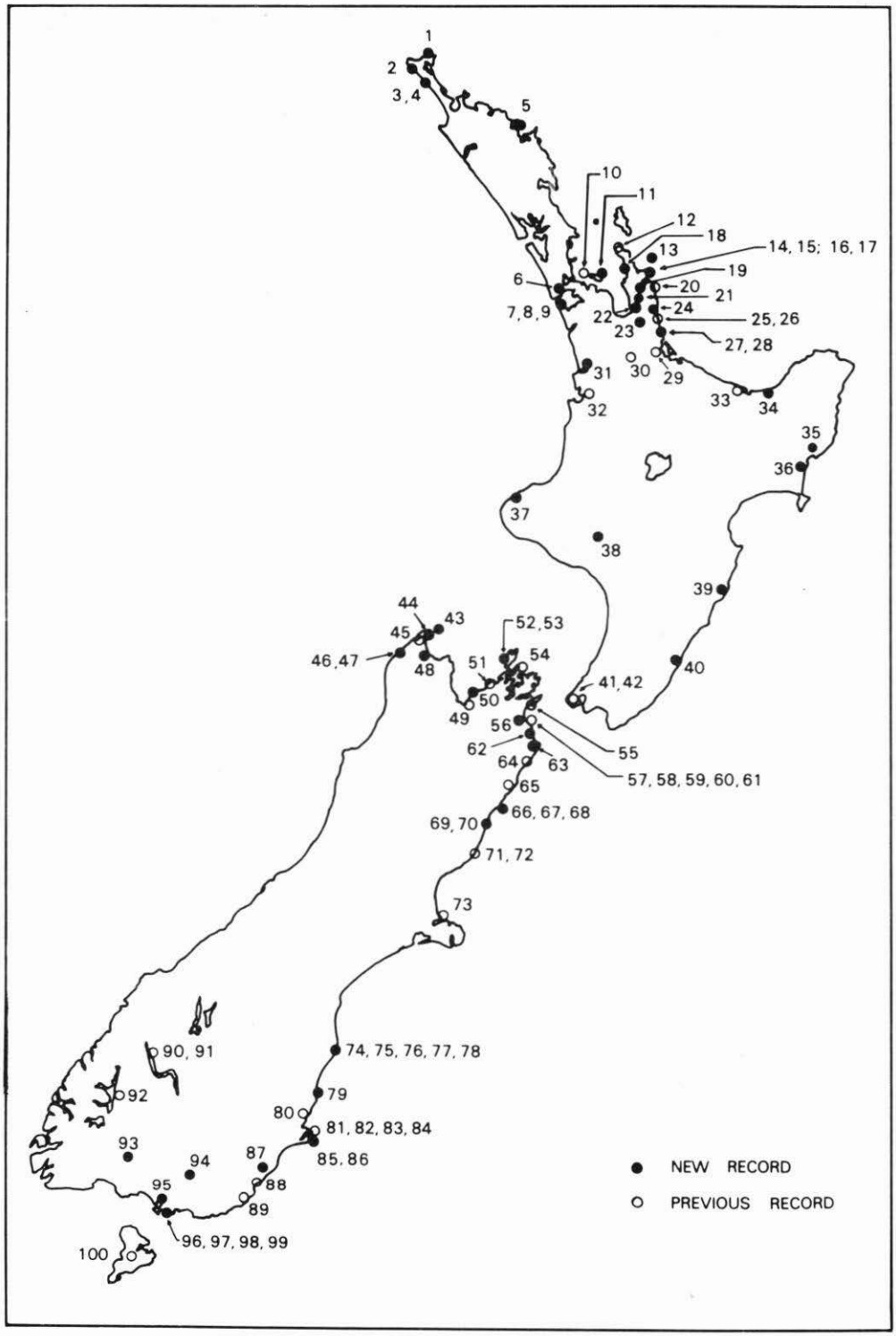

Figure 2 Geographic distribution of localised specimens. (Specimen numbers refer to Table 1)

"composite-hafted adze" working at right-angles to a surface could not entirely substitute for the Archaic side-hafted adze which, working parallel to a timber face, had the advantage that it could be used in an extremely narrow space – such as in the trimming or under-cutting of the internal sides of a narrow-hulled canoe. The question that immediately arises is whether, with the abandonment of the specialised, Archaic, side-hafted adze, the Classic Maori also introduced a basic modification to canoe design and construction; a change from narrow-hulled canoes (possibly without top strakes) to broader, more open-hulled canoes (fitted with top strakes). If, as suggested above, Classic culture was initiated by a new trend towards inland settlement, then in areas possessing large rivers, e.g. Waikato, canoe building and canoe transport would have been particularly important. The combination of the use of large-girthed softwood trees, such as kauri and totara, found in inland areas and the fact that many canoes were used only in the sheltered conditions of inland waterways could have meant that broad-hulled canoes requiring a minimum of free-board became popular. The need to increase free-board for sea-going canoes was accomplished by the addition of top-strakes. Broad and shallow hulls (see Barrow and Keyes 1966: 283 for cross sections) could easily be adzed with conventional Type 2B adzes, and specialised side-cutting adzes were no longer required.

The alternative to speculating that the side-hafted adze had a direct relationship with narrow-hulled canoes is to take the opposite view and regard it simply as a traditional adze type unrelated to any specific canoe design. Use of the side-hafted adze by New Zealand's Archaic population can be regarded as the continuation of an established basic, conservative, Eastern Polynesian tradition rather than part of an essential technology. Under changed cultural circumstances, however, it was abandoned, along with other adze types, when it was found to be no longer technologically advantageous, and replaced by the single, versatile, multi-purpose adze type developed by the Classic Maori. The loss of the side-hafted adze in the North Island may therefore not indicate any change in canoe design. It simply became a "casualty of culture change", lost in favour of adze style rationalisation.

PREVIOUS SPECIMEN RECORDS

Up until this paper, published records of South Island examples of the side-hafted adze (Duff 1977) far exceeded those of the North Island. Of the 36 examples known to Duff (1977), only six were recorded from the North Island. This situation led Duff to observe that the side-hafted or Type 5 adze was absent "over the greater part of the North Island" (Duff 1977), being confined essentially to the Coromandel area and western shores of Cook Strait. In recent years, however, several additional specimens from the North Island have been brought to light. Some of these have been published (Golson 1959; Crosby 1963, 1977; Leahy 1974), but many other finds have not been reported. With this paper it is now possible to correct the curious imbalance in the distribution of side-hafted adzes that has existed for more than 20 years. South Island records now only slightly exceed those for the North Island, recent work by Orchiston (1974) having added 16 specimens to the South Island list. In total, 100 localised records plus four unlocalised are now available, 64 being additional to Duff (1977). Surprisingly, no examples of the side-hafted adze have been reported from the Chatham Islands.

LIST OF SIDE-HAFTED ADZES

All records of the side-hafted adze in New Zealand known to us (up until December 1977) are listed in Table 1. This includes specimens previously described in publications by Duff (1977) and others and examples reported for the first time.

Only those specimens considered to be "typical" side-hafted adzes, i.e. those conforming essentially to Duff's (1959, 1977) description of the Type 5A, have been included in Table 1. A number of questionable examples, particularly those which appear to be

modified Type 1A, 2A or 4A adzes, some very small, chisel-like specimens, and a few roughouts have been excluded.

Where possible, adzes were examined and measured by one or more of the writers. Otherwise information is drawn from published sources or was kindly supplied by others. Some of Duff's (1977) recorded specimens have also been re-examined, measured and the lithology amended where necessary, but a considerable number of adzes were not available for inspection.

The greywacke Canterbury Plains specimen, No. 17, whose validity Duff questions (Duff 1977: 186, 197), is excluded as it appears on examination (Orchiston 1974: 2.166) to be a different type. Duff (1977: 186) does not accept as valid the two nephrite examples, one from Wellington (Skinner 1919) and the other from Glenorchy, Lake Wakatipu (Skinner correspondence, see Duff 1977), although they were not seen by him. The existence, however, of side-hafted adzes in this material is established by a further example recorded by Orchiston (1974: 2.166, table 2.50 – this paper Table 1, specimen No. 68) from the site of the Kaikoura Peninsula Archaic burial (Dell and Falla 1972).

Simmons (1973, table 3) lists side-hafted adzes from six South Island sites. The numbers of specimens quoted for four of the localities have been confirmed by us, but we cannot confirm the totals of five specimens from Golden Bay and four from a Hurunui cache (Duff 1977: 274), and these extra specimens have therefore not been included in Table 1.

NOTES ON TABLE 1.

1) Specimen records have been listed geographically from north to south and each record assigned a number. These numbers appear on the accompanying map (Fig. 2) indicating the geographic distribution of occurrences. New records, i.e. those not previously described in formal publication, carry an asterisk.
2) Measurements are as follows (in mm):
   L = maximum overall *length*, from butt to cutting edge.
   W = greatest *width*, from base to anterior (apical) surface.
   TH = maximum *thickness*; thickness recorded by others may, in some instances, be width of the base and not necessarily *maximum* thickness.
3) The position of the blade bevel is indicated by "R" (right) or "L" (left hand side). Following the usage of Duff (1977), the right hand side of the adze is taken as that which is adjacent to a viewer's right hand when the adze is placed on its base (with apex uppermost) on a table with the cutting edge pointing directly away from the viewer, i.e. right lateral surface coincides with the right side of the artisan swinging a hafted specimen.
4) Rock types have been checked in specimens seen, but if specimens have not been examined then previously cited determinations have been repeated. "Meta. argillite" is used as an abbreviation for "metasomatised argillite".
5) All references to literature in which specimens are recorded or figured are cited. In the case of adzes listed by Duff (1939, 1942, 1950, 1956, 1977) only the last reference is quoted, along with Duff's identification numbers.

STATISTICAL PARAMETERS, DISTRIBUTION, COMPOSITION AND AGE RANGE

STATISTICAL ANALYSES

Measurements for 83 specimens are recorded in Table 1 and used in two scatter diagrams (Fig. 3) in which specimens are plotted and their rock types indicated. In Fig. 3A specimen length is plotted against width. Maximum width can occur either at the cutting edge or in a more medial position. Because of the tendency for some specimens to have convex anterior and concave posterior longitudinal surfaces, width measurements were taken as being the greatest distance between a base line joining the extreme

TABLE 1: LIST OF

NORTH

NO.	LOCALITY	REPOSITORY	CAT. NO.	L	W
* 1	Tom Bowling Bay	Joyce Booth Coll., Kerikeri	-	145	57
* 2	Scott Point	Dagmar Gleve Coll., Scott Point	-	165	60
* 3	The Bluff	Aupouri Forest Coll.	SF187/41	220	91
* 4	The Bluff	Aupouri Forest Coll.	SF187/42	170	77
* 5	Purerua Peninsula	W.R. Paterson Purerua	-	190	85
* 6	Parau, Waitakere	Auckland Museum	47249	160	63
* 7	South Manukau Head	Bramley Collection	-	210	c.70
* 8	South Manukau Head	Bramley Collection	-	255	90
* 9	South Manukau Head	Bramley Collection	-	180	80
10	Motutapu Island	Auckland Museum	-	125	61
* 11	Waiheke Island	T. Dennis, Waiheke	-	195	95
12	Cape Colville	Auckland Museum	27664	150	67
* 13	Great Mercury Island	Mizen Collection	M94	140	50
* 14	Tahanga	Jolly Collection	RJ43	180	75
* 15	Tahanga	Auckland Museum	AU1836/3	147	60
16	Opito	Jolly Collection	RJ80	170	70
* 17	Opito	Auckland Museum	AU1635/4	200	70
* 18	Koputauaki, Coromandel	B. Parks, Golden Bay	-	140	47
* 19	Whitianga Pa	N. McDougall	-	205	65

SPECIMENS

ISLAND

TH	BEV -EL	MATERIAL	REFERENCE	NOTES
30	R	Tahanga Basalt	D. Simmons (pers.comm.)	
35	R	Tahanga Basalt?	D. Simmons (pers.comm.)	
50	R	Tahanga Basalt?	J. Coster (pers.comm.)	
38	L	Tahanga Basalt?	J. Coster (pers.comm.)	
-	L	meta. argillite	D. Simmons (pers.comm.)	
35	R	Tahanga Basalt		
30	L	Tahanga Basalt?	D. Simmons (pers.comm.)	
30	L	greywacke	D. Simmons (pers.comm.)	roughout
30	R	greywacke	D. Simmons (pers.comm.)	roughout
32	R	greywacke	Golson (1959:45); J. Davidson (pers.comm.)	from site N38/21
24	R	Matiatia basalt	D. Simmons (pers.comm.)	roughout
30	R	Tahanga Basalt	Duff (1977:196, No. 2)	
23	R	Tahanga Basalt	D. Simmons (pers.comm.)	from Tamawera Pa area
45	?	Tahanga Basalt		roughout
32	L	Tahanga Basalt		roughout
35	R	Tahanga Basalt	Green (1963:64)	roughout; site N40/2
53	R	Tahanga Basalt		roughout
32	R	Tahanga Basalt?	D. Simmons (pers.comm.)	
30	R	Tahanga Basalt	D. Simmons (pers.comm.)	

NO.	LOCALITY	REPOSITORY	CAT. NO.	L	W
20	Hot Water Beach	Auckland Museum	AR2521	133	50
* 21	Crosbie's Settlement, Coromandel	Auckland Museum	35518.3	153	48
* 22	Thames	Hammond Collection	-	-	-
* 23	Hikutaia	Murdock Collection	-	175	70
* 24	Whangamata	Murdock Collection	-	203	70
25	Whiritoa, north end	Auckland Museum	AU1200/1	175	63
* 26	Whiritoa, north end	H. Claxton, Thames	-	-	-
* 27	Waihi Beach	Auckland Museum	27839	225	80
* 28	Waihi Beach	Hammond Collection	-	148	54
29	Katikati	Muir Collection, National Museum	-	-	-
30	Tauhei, Morrinsville	Otago Museum	D37.379	199	66
* 31	Raglan	Auckland Museum	33625	140	68
32	Kawhia	R. Barwick Coll.	-	-	-
33	Whakatane	Sherman Collection, U.S.A.	MP758	178	80
* 34	Tirohanga, Opotiki	Tew Collection, Opotiki	-	100	43
* 35	Gisborne	Murdock Collection	-	173	67
* 36	'Waihina',Maraetaha	I. Faulkner	-	198	82
* 37	Omata, New Plymouth	Taranaki Museum	A78.889	170	95
* 38	Hiruharama (Jerusalem), Wanganui		-	130	70
* 39	Blackhead	P. Hunter Collection, Porangahau	-	145	48
* 40	Castlepoint	National Museum	D22	206	79

TH	BEV -EL	MATERIAL	REFERENCE	NOTES
38	R	Tahanga Basalt	Leahy (1974:47, fig.22)	Site N44/69
25	R	dark grey meta. argillite		no tang; exact locality unknown
-	-	-	Crosby (1978)	from cache
28	R	Tahanga Basalt?	D. Simmons (pers.comm.)	
44	R	Sinter		roughout
35	L	Tahanga Basalt	Green (1959:24), Crosby (1963:47, pl.7)	no tang; from cache N53-54/4
-	R	-	Crosby (1978)	
45	R	Tahanga Basalt		
36	R	Tahanga Basalt	D. Simmons (pers.comm.)	
-	R	-	Duff (1977:196, No.3)	specimen not relocated
34	R	tuff?	Duff (1977:196, No.1)	
25	R	med. grey meta. argillite		
-	R	basalt	Duff (1977:196, No.2A)	
36	R	light grey meta. argillite,blk veins	Moore (1977:6)	cast held at Whakatane Museum
10	R	veined, meta. argillite	D. Simmons (pers.comm.)	
35	R	Tahanga Basalt		
47	R	Tahanga Basalt		
45	L	med. grey meta. argillite		
22	R	basalt	D. Simmons (pers.comm.)	specimen not relocated
25	R	meta.argillite	D. Simmons (pers.comm.)	
35	R	light grey meta. argillite with black veins	'Evening Post' 2/7/76	

NO.	LOCALITY	REPOSITORY	CAT. NO.	L	W
41	Wellington	British Museum	NZ12	206	87
42	Wellington	-	-	-	-

SOUTH

NO.	LOCALITY	REPOSITORY	CAT. NO.	L	W
* 43	Farewell Spit	Nelson Museum	E159.65	174	59
* 44	Puponga	Nelson Museum	E160.65	104	55
45	Whanganui Inlet	Nelson Museum	E151.70	238	90
* 46	Big River	Richards Collection	-	348	123
* 47	Big River	Richards Collection	-	220	90
* 48	Golden Bay	Auckland Museum	25484	205	85
49	? Nelson	Canterbury Museum	-	-	-
* 50	Wakapuaka	Nelson Museum	E455.65	123	65

TH	BEV -EL	MATERIAL	REFERENCE	NOTES
38	R	light grey meta. argillite	Edge-Partington (1890-8, Vol.2:233, f.1) Skinner (1919); Duff (1977:196, No.5)	
-	R	nephrite	Skinner (1919); Duff (1977:196, No.4)	validity doubted; specimen not relocated

ISLAND

TH	BEV -EL	MATERIAL	REFERENCE	NOTES
25	R	pale grey meta. argillite with black veins	Orchiston (1974) F.B. & M. Knox pers.comm.	
20	-	black meta. argillite	Orchiston (1974) F.B. & M. Knox pers.comm.	Prob. from Triangle Valley, base of Farewell Spit
38	L	pale grey meta. argillite	Duff (1977:196, No.7)	"Westhaven" of Duff. Possibly from Rakopi
47	—	dark grey meta. argillite	Orchiston (1974)	On loan to Takaka Library
41	-	pale grey meta. argillite with black veins	Orchiston (1974)	On loan to Takaka Library
35	R	light grey meta. argillite with black veins	Orchiston (1974)	
-	-	meta. argillite	Duff (1977:196, No.8)	On loan to Stafford Museum
25	—	black meta. argillite	Orchiston (1974)	

NO.	LOCALITY	REPOSITORY	CAT. NO.	L	W
51	Whangamoa R. mouth	Canterbury Museum	-	-	-
52	D'Urville Island	Nelson Museum	-	-	-
* 53	D'Urville Island (Greville Harb.)	Nelson Museum	E286.65	93	26
54	Te Rawa, Pelorus Sound	Otago Museum	D44.150	212	72
55	Port Underwood	Canterbury Museum	E139.23	-	-
* 56	Blenheim	National Museum	ME12783	178	90
* 57	Wairau Bar	Canterbury Museum	E163.89	-	-
58	Wairau Bar	Canterbury Museum	E142.187	182	63
59	Wairau Bar	Canterbury Museum	W646	199	72
60	Wairau Bar	Canterbury Museum	W1434	220	100
* 61	Wairau Bar	Canterbury Museum	E150.47	-	-
* 62	Vernon	Balfour Collection	-	246	94
* 63	Cape Campbell	C. Collett Coll.	261	147	84
64	Wharanui Station, Woodside	Canterbury Museum	E138.1227	186	74
65	Waipapa Bay	Otago Museum	-	-	-
* 66	Kaikoura	Auckland Museum	21684.1	245	93

TH	BEV -EL	MATERIAL	REFERENCE	NOTES
-	-		Duff (1977:196, No.7A)	roughout S15/8 or 9
-	-	meta. argillite	Skinner (1919) Duff (1977:196, No.6)	
	-	meta. argillite	F.B. & M. Knox (pers. comm.)	
39	R	grey black meta. argillite with dark veins	Skinner 1938; 1974:113, fig. 6.21 Duff (1977:196, No.9)	= Wilson Bay, Pelorus Sound
-	L	dark grey meta. argillite	Duff (1977:196, No.10)	From cache with 1A,1B,3C and 4A adzes.
34	R	dark grey meta. argillite	Orchiston (1974)	Maxwell Road
-	R	dark grey meta. argillite with lighter patches	M. Trotter (pers.comm.)	S29/7
38	R	dark grey meta. argillite	Duff (1942, pl.12, f.D; 1977:196, No.11)	S29/7 Burial 4 Duff (1977, Append 4)
34	R	dark grey meta. argillite	Duff (1977:196, No.11. P.191, fig.48, top left)	S29/7 Duff (1977, Append 5)
42	-	dark grey meta. argillite	Duff (1977:196, No.11)	S29/7 Duff (1977, Append 5)
-	R	light grey meta. argillite with black veins	M. Trotter (pers.comm.)	S29/7
44	-	dark grey meta. argillite	Orchiston (1974)	
35	-	black meta. argillite	Orchiston (1974)	Prob. Marfels Beach. S29/8
29	R	medium grey meta. argillite	Duff (1939, pl.32, fig. 1a-c; 1977:196, No.12)	
-	-	? meta. argillite	Duff (1977:196, No.12A)	S42/5
45	R	grey meta. sandst. with black veins	Orchiston (1974)	

NO.	LOCALITY	REPOSITORY	CAT. NO.	L	W
67	Kaikoura Peninsula	Canterbury Museum	E138.314	219	80
* 68	Kaikoura Peninsula	G. Low Collection	-	166	92
* 69	Conway River mouth	Canterbury Museum	Y1019	262	95
* 70	Conway River mouth	A. Anderson Coll. Conway, R.D.	-	-	-
71	Hurunui River mouth	Gillanders Coll.	-	276	97
72	Hurunui River mouth	Gillanders Coll.	-	197	58
73	Redcliffs Flat	Canterbury Museum	E162.447	146	68
74	Waitaki River mouth	Otago Museum	D30.738	186	78
* 75	Waitaki River mouth	Otago Museum	D30.739	172	74
* 76	Waitaki River mouth	Willetts Collection	W82	186	69
* 77	Waitaki River mouth	Willetts Collection	W83	240	96
* 78	Waitaki River mouth	Willetts Collection	W522	216	79
* 79	Shag River mouth	Otago Museum	D65.476	240	91
80	Waikouaiti	Otago Museum	D23.470	166	72
81	Murdering Beach	Otago Museum	-	-	-
82	Murdering Beach	Otago Museum	D54.64	145	69
83	Otago Peninsula	Johnson Collection	-	-	-
84	Otago Peninsula	Johnson Collection	-	-	-
* 85	Wickliffe Bay	Otago Museum	D55.774	220	72

TH	BEV -EL	MATERIAL	REFERENCE	NOTES
36	R	dark grey meta. argillite	Duff (1977:196, No.13)	
22	-	nephrite	Orchiston (1974)	S49/46
47	R	basalt	M. Trotter (pers.comm.)	prob. Lagoon Flat site S55/19 ex A.Anderson Coll.
-	-		M. Trotter (pers.comm.)	prob. Lagoon Flat site S55/19
34	R	dark grey meta. argillite	Duff (1945:159; 1977:196, No.14. P.191, f.48 top rt; pl.34, f.1, Append 3)	S62/10
25	R	pale grey meta. argillite	Duff (1977, pl.34, f.2; Append 3; p.196, No.14)	S62/10
22	R	pale grey meta. argillite with black specks	Duff (1977, pl.35, f.7; Append 3; p.197, No.16)	S84/76
50	R	light grey meta. argillite	Skinner (1938;1974:113) Duff (1977:197, No.18)	S128/1
40	-	pale grey "material"	Anonymous n.d.:5	S128/1
39	-	medium grey meta. argillite	Orchiston (1974)	S128/1
48	-	dark grey argillite	Orchiston (1974)	S128/1
36	-	pale grey argillite	Orchiston (1974)	S128/1
35	R	grey-black meta. argillite	Orchiston (1974)	S155/5
43	R	dark green fine grained meta.tuff.	Duff (1977:197, No.19)	
-	-	"(?) basalt"	Duff (1977:197, No.20)	S164/16?
29	R	green grey tuff	Duff (1977:197, No.20)	S164/16?
-	-		Duff (1977:197, No.22)	
-	-		Duff (1977:197, No.22)	
35	R	dark green coarse meta.greywacke		

NO.	LOCALITY	REPOSITORY	CAT. NO.	L	W
86	Cape Saunders	National Museum	ME3930.2	170	75
* 87	Clarksville	G. Smith Collection	-	-	-
88	Clutha River mouth	National Museum	ME5701	179	73
89	Pounawea	Otago Museum	-	-	-
90	Glenorchy	Otago Museum	D44.259	170	60
91	Glenorchy	Otago Museum	D44.314	138	58
92	Lake Te Anau	Otago Museum	-	-	-
* 93	White Hills, Ohai	Southland Museum	S168/2	255	102
* 94	"Southland"	Southland Museum	-	240	85
* 95	Invercargill	Southland Museum	S177/8	280	90
* 96	Tiwai	Southland Museum	S181-182/16	167	84
* 97	Tiwai	Southland Museum	S181-182/16	174	73
* 98	Tiwai	Southland Museum	S181-182/16	179	70
* 99	Tiwai	Southland Museum	S181-182/16	147	60
100	Stewart Island	Otago Museum	-	-	-

TH	BEV -EL	MATERIAL	REFERENCE	NOTES
42	L	dark grey basalt	Skinner (1919) Duff (1977:197, No.21)	roughout Prob. from Little Papanui. S164/1
-	-	"argillite"	Orchiston (1974), H. Knight (pers.comm.) August 1971	
34	R	medium grey meta. argillite	Duff (1977:197, No.23)	"Molyneaux"
-	-	basalt(?)	Lockerbie (1959, pl.4b) Duff (1977:197, No.24)	S184/1 C14 date
-	L	"nephrite"	Duff (1977:197, No.27)	
-	R	"dark basalt"	Duff (1977:197, No.25)	
-	-	"(?) diorite"	Duff (1977:197, No.26)	
48	R	Southland meta. argillite		
35	R	Southland meta. argillite		precise locality unknown
42	R	Southland meta. argillite	Orchiston (1974)	Southland College site
40	-	Southland meta. argillite		roughout
51	-	Southland meta. argillite		roughout
45	-	Southland meta. argillite		roughout
45	-	Southland meta. argillite		roughout
-	-	"(?) basalt"	Duff (1977:197, No.28)	

UNLOCALISED

	LOCALITY	REPOSITORY	CAT. NO.	L	W
	New Zealand	Auckland Museum	8277.48	183	85
*	New Zealand	Auckland Museum	—	180	60
*	New Zealand	National Museum	ME11923	201	62
*	New Zealand	Canterbury Museum	-	—	-

* = new records

SPECIMENS

TH	REV -EL	MATERIAL	REFERENCE	NOTES
35	R	tuffaceous? sandstone	Simmons (1973:9, fig.9)	
40	R	Tahanga Basalt		almost certainly from North Island
50	L	greywacke		
–	L	dark grey argillite with lighter streaks	M. Trotter (pers.comm.)	almost certainly from South Island (on display)

points on the posterior surface and the highest apical point of the anterior surface, at right angles to the base line. In Fig. 3B, length is plotted against thickness. Similar methods of analysis have been previously used by Green and Purcell (1961).

From Fig. 3A, a fairly predictable degree of lineal correlation can be seen between specimen width and length; the correlation coefficient of +0.79 indicates a reasonably consistent relationship between these two parameters. Student's t = 11.7, and the correlation coefficient is statistically "highly significant" (t = 3.5 at the 0.1% significance level). Fig. 3B shows that specimen thickness does not increase greatly in relation to an increase in length, i.e. specimens maintain a general thinness regardless of length. This is a recognised feature of the 5A adze type. The correlation coefficient of +0.52 reveals, however, that the relationship between these two factors is less consistent than between length and width. Student's t = 5.5, however, and the correlation coefficient is therefore statistically "significant".

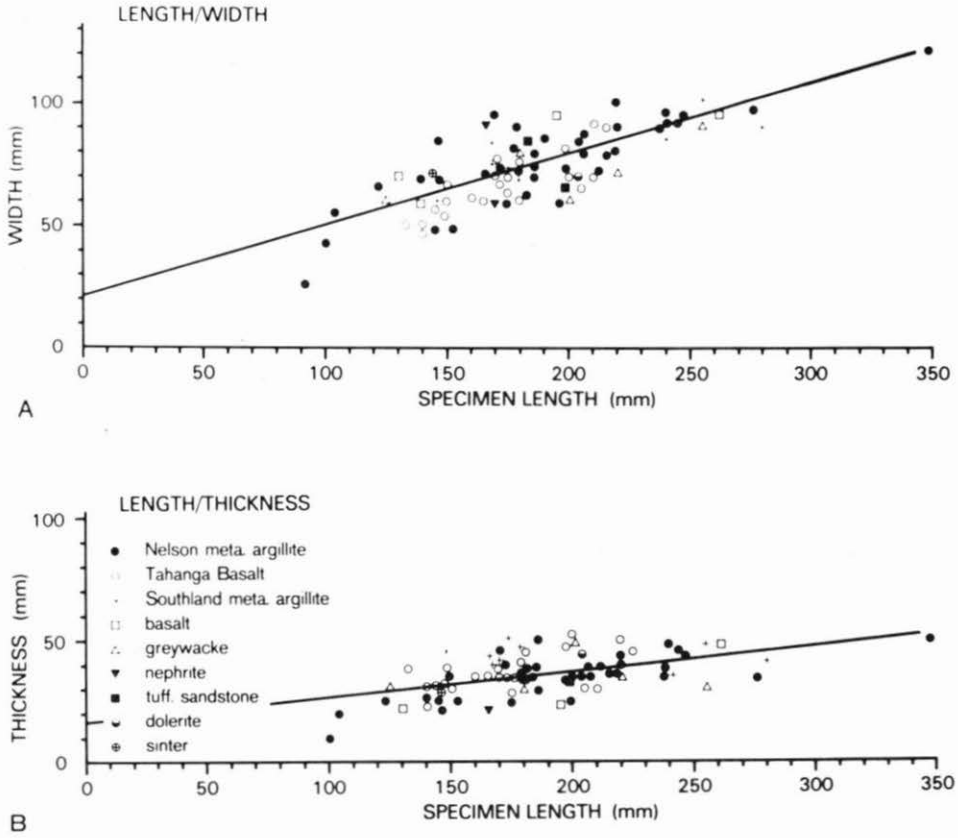

Figure 3 Bivariate plot of measured specimens: A. length and width; B. length and thickness. Graphs demonstrate the degree of dimensional uniformity present amongst side-hafted adzes. Correlation coefficients = +0.79 and +0.52 respectively; regression line calculated using Hewlett-Packard programme. Rock type of specimens is also indicated.

In both plots, specimens made from Nelson-D'Urville Island metasomatised argillite form the extremes of size whereas those of Coromandel Tahanga Basalt show a much tighter clustering in a more medial position. Means and standard deviations are:

	All New Zealand	*North Island*	*South Island*
Length	185.8 ± 43.3 mm	173.0 ± 32.6 mm	196.6 ± 49.8 mm
Width	73.6 ± 15.9 mm	69.0 ± 14.0 mm	77.2 ± 17.2 mm
Thickness	35.8 ± 8.5 mm	33.8 ± 8.6 mm	37.4 ± 8.0 mm

North Island specimens are clearly smaller in general than those from the South Island, a feature which is common to all New Zealand Archaic adze types.

In Table 1 the position of the blade bevel is recorded for 73 specimens. Of these, 13 specimens (17.8%) have a left-hand bevel. This figure may be contrasted with 60 specimens (82.2%) which have the bevel on the right-hand side, very probably consistent with the dominance of right-handedness.

DISTRIBUTION

The location of all known side-hafted adzes is plotted in Fig. 2. The most obvious feature is the remarkable coastal distribution, with the few inland examples being located on or close to major rivers or lakes. In the North Island there is a conspicuous cluster in the Auckland-Coromandel region and a lesser concentration in the far north. In the South Island, finds are strongly clustered in the Nelson-Marlborough-Kaikoura region and along the Otago-Southland coast. The only inland example not located near a major waterway is that from Ohai (No. 93) and possibly the specimen (No. 94) from "Southland".

Almost as striking as the concentrations are the large areas where side-hafted adzes have not yet been recorded. The obvious gaps are the whole of the West Coast, the central part of the South Island, and coastal South Canterbury. In the North Island the most clearly evident gaps are central and western Northland and the central volcanic region. These bare areas may, in part, reflect the paucity of archaeological research and collecting, but it is likely that the gaps at least in the central North Island, the West Coast and inland South Island are real. It is perhaps surprising, though, that no 5A adzes have been found around the central North Island lakes or beside the large lakes of the South Island except for Te Anau and Wakatipu. However, this absence would substantiate the belief that Archaic period settlement was predominantly coastal.

COMPOSITION

Only five main rock types were used in the manufacture of side-hafted adzes – Nelson-D'Urville Island metasomatised argillite, Tahanga basalt, Southland metasomatised argillite, nephrite and greywacke. Minor materials include basalt from other sources, tuffaceous sandstone, dolerite and sinter. Adzes in Nelson-D'Urville Island metasomatised argillite are by far the most common (Fig. 4), with 44 specimens (45% of the 97 lithologically determined specimens) and 64% of South Island examples being made from this material. Tahanga basalt is the dominant lithology in the North Island with 22 specimens (52%) being made from this material.

The geographic distribution of adzes and their composition is plotted in Fig. 5. The widespread distribution of Nelson-D'Urville Island metasomatised argillite with a strong concentration close to the main argillite quarries of Nelson and D'Urville Island is apparent. In the northern half of the North Island, however, Tahanga basalt was frequently used in preference to metasomatised argillite, but other rock types such as greywacke were also important. The southern limit of Tahanga basalt 5A adzes more or

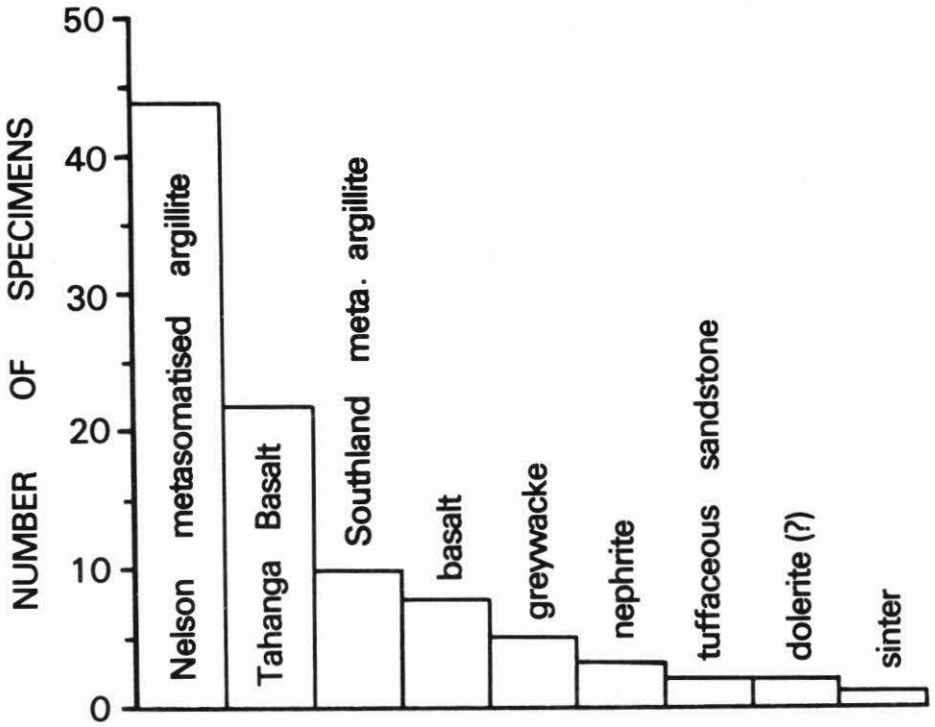

Figure 4 Histogram of rock types used in side-hafted adzes based on 96 determined specimens in Table 1.

less coincides with a zone of marked decline in abundance of other adze types (Moore 1975: Fig. 1; Best 1975: Fig. 4).

A mirror image of North Island rock type distribution is present in the South Island, although the area of influence of Southland metasomatised argillite is possibly smaller, extending only as far as Otago. Other rock types such as metagreywacke and tuff are also important in this southern area.

Present knowledge of the three main rock types used, Tahanga basalt (Moore 1975, 1976), Nelson-D'Urville Island metasomatised argillite (Keyes 1975a) and Southland metasomatised argillite (Keyes 1975a; Orchiston 1974: 2.70-74), makes it possible to trace the origins of some specimens to a precise regional source. In fact, in the case of several examples in "metasomatised argillite" (light to medium grey tuffaceous sediment threaded with fine distinctive black quartz veins; Table 1, specimen numbers 33, 40, 43, 47, 48, 61, 66), it is possible to trace specimens to actual quarry sites either at Ohaua Bay at the south end of D'Urville Island (sites S10/32-34, Keyes 1975a: 7), or to Whangamoa (Wilkes and Scarlett 1967: 204-5). The Coromandel Tahanga basalt and Nelson-D'Urville Island metasomatised argillite quarries were the earliest and main sources of high quality rock from which most early artefacts in New Zealand prehistory were manufactured. The early discovery of these rock types and their consistent use suggests that Nelson and Coromandel were areas of significant early settlement (Simmons 1969) which became focal points for adze distribution, if not for elaborate prehistoric trade networks (Keyes 1975a, b). The distribution of the side-hafted adze (Fig. 5) serves to demonstrate the diffusion of these rock types from the two most important centres of rock exploitation and adze manufacture in New Zealand prehistory.

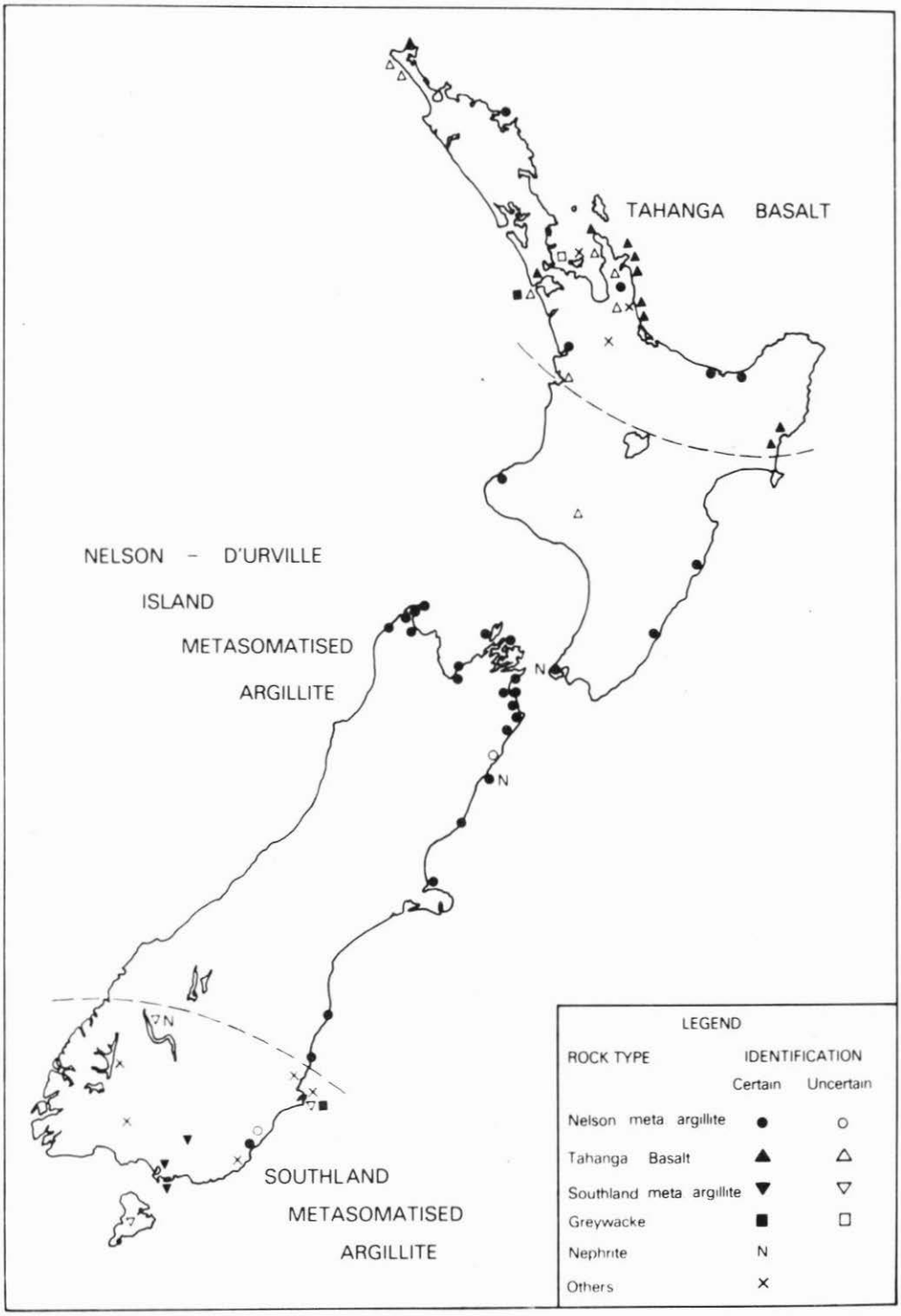

Figure 5 Geographic distribution plot of rock types (see Fig. 2 for specimen numbers) with approximate limits of Tahanga basalt, Nelson-D'Urville Island metasomatised argillite and Southland metasomatised argillite.

DATING

Twenty-one of the specimens listed in Table 1 have been obtained from archaeological contexts for which radiocarbon dates are available. These dates serve as a means of indirectly establishing the age of the adzes. The relationship of some specimens to the radiocarbon dates obtained is variable. Three adzes are from precisely known stratigraphic positions in sites for which dates are either directly available or obtained from horizons above and below the artefact layer (Nos. 1, 2, 9 below). Other adzes, however, are from multi-occupational sites and their stratigraphic position is unknown. Dates from these sites may not have any true relationship to the adzes, dating stratigraphy either older or younger than that from which the artefacts were obtained. Dates in this category (Nos. 3 - 8) can only provide possible age limits for specimens; whether they express a lower or upper age limit must remain unknown.[1] Lists of these archaeological site dates are also available in McCulloch and Trotter (1975) and Moore and Tiller (1975). Specimen numbers cited refer to Table 1.

1. Specimen No. 10; Motutapu Island, Site N38/21. Adze obtained from "Layer 4", mid point in the deposits (Brothers and Golson 1959). Two dates are available (from shells and wood) from the lowest horizon (Layer 1), which underlies the Rangitoto Ash and initial occupation at the base of the section, 750 ± 50 and 770 ± 50 BP (NZ-220 and NZ-222). The uppermost horizon (Layer 9) provides a terminal occupation date, 280 ± 40 BP (NZ-221: Grant-Taylor and Rafter 1963). Law (1975) estimates the Rangitoto Ash shower to be a 14th or 15th century event on re-interpretation of the dates, so the relative position of Layer 4 would suggest that it was formed during the 1400s or 1500s, thus relating the adze to the 15th or 16th century.
2. Specimen No. 20; Hot Water Beach, Coromandel, Site N44/69. Adze (Leahy 1974) obtained from Layer 5. Initially three dates from charcoal and grease were obtained from Layer 4 above (Leahy 1971), and later increased to seven from additional shell samples (Leahy 1974: table 15). From these, five reliable dates, 421 ± 40 BP (NZ-1169), 484 ± 79 BP (NZ-1170), 453 ± 40 BP (NZ-1296), 524 ± 40 BP (NZ-1297), 325 ± 78 BP (NZ-1299), give an age span between the 15th and 17th centuries. These dates, recalculated using new half life and corrected for secular effects as 457 ± 50, 501 ± 89, 470 ± 50, 557 ± 50, 417 ± 88 BP (Leahy 1974: table 15) indicated that a date somewhere between A.D. 1350 and 1540 was more likely and a 15th century age for Layer 4 more reliable. Layer 5, with the side-hafted adze, other artefacts and Loisels pumice is considered to have formed after A.D. 1300 (the age of the pumice), some time in the 14th century (Leahy 1974).
3. Specimen Nos. 57-61; Wairau Bar, Site S29/7. Stratigraphic positions unknown. Original charcoal samples from an oven at Wairau Bar relating to the main period of occupation gave dates of 850 ± 50 BP (NZ-50: Grant-Taylor and Rafter 1963; Trotter 1975a), and 935 ± 110 BP (Y204: Trotter 1975a). These dates suggest 11th and 12th century occupation. Additional samples from later work have given dates of 780 ± 80 BP (NZ-1835) on human bone collagen, 680 ± 50 BP (NZ-1837) on shell, and 590 ± 60 BP (NZ-1838) on moa bone collagen spanning the 12th to 14th centuries (Trotter 1975a; Trotter *in* Duff 1977: 354). All that can be stated is that the five adzes from Wairau Bar (including Burial No. 4) belong to 11th to 14th century occupations.
4. Specimen Nos. 71 and 72; Hurunui River mouth, Site S62/10. A date of 730 ± 80 BP (NZ-1839a) from moa bone collagen (McCulloch and Trotter 1975: 17) for a moa-hunter oven near the mouth of the Hurunui River is possibly applicable to the typical Archaic adzes and other artefacts which have been collected nearby as part of the same occupation complex. A 13th century date could tentatively be assigned to the side-hafted adzes.

5. Specimen No. 73; Redcliffs Flat, Site S84/76. Investigations of this moa-hunter camp site (Trotter 1967, 1975b) have produced seven radiocarbon dates from three separate features. One of these dates, 515 ± 90 BP (NZ-460: Grant-Taylor and Rafter 1971) from moa bone carbonate, is considered by Trotter (1975b: 204) to be possibly contaminated, giving an age too young. Another, 1170 ± 65 BP (NZ-438: Grant-Taylor and Rafter 1971) from charcoal, is considered by him too old. Five dates remain; 787 ± 82 BP (NZ-459) from charcoal, 735 ± 56 BP (NZ-1113) from moa bone collagen, 617 ± 34 BP (NZ-1111) from shell, 615 ± 40 BP (NZ-1162) and 581 ± 40 BP (NZ-1376) from moa bone collagen (Trotter 1975b: 204) which appear to more reliably reflect the age of occupation on the flat. Averaging these five dates gives a mean of 667 ± 50 BP. No stratigraphic details are known for the side-hafted adze from this site but from the dates available it can be considered to be derived from a 13th or perhaps early 14th century occupation.
6. Specimen Nos. 74-78; Waitaki River mouth, Site S128/1. Orchiston (1974: 3.40) obtained a date of 600 ± 80 BP (SUA-61; Gillespie and Temple 1973: 569) on moa bone (*Euryapteryx gravis*) from the base of the occupation stratum in an undisturbed section of Teviotdale's (1939: 176-77) "second midden". Although no stratigraphic details are known a 14th century date would appear to be applicable to this site generally and to the side-hafted adzes present.
7. Specimen No. 79; Shag River mouth, Site S155/5. Charcoal dates of 845 ± 55 BP and 823 ± 45 BP (correctly cited by Moore and Tiller, 1975) have been obtained from moa bone in the basal occupation levels of this site (Simmons and Wright 1967: 72; McCulloch and Trotter 1975). The adze thus dates to the 12th century or later.
8. Specimen Nos. 96-99; Tiwai Point, Site S181/16. This multi-occupational site has produced six dates from wood charcoal obtained in two excavation areas. Dates of 442 ± 53 BP (NZ-2480) (McCulloch and Trotter 1975), 770 ± 80 BP (NZ-4466), 770 ± 60 BP (NZ-4467), 700 ± 40 BP (NZ-4468), 660 ± 40 BP (NZ-4469) and 640 ± 40 BP (NZ-4470) (Park 1978) cover a 12th to 16th century occupation range. If however the first date of 442 ± 53 BP is ignored through its lack of close correspondence with the remaining five, then a more restricted period of occupation from the 12th to 14th century can be suggested for the site and applied to the four roughout specimens which were collected.
9. Specimen No. 89; Pounawea, Site S184/1. An unfinished specimen (Lockerbie 1959: pl. 4b) from the lowest horizon containing artefacts has been dated from associated charcoal to the 12th century (810 ± 60 BP; NZ-58, Grant-Taylor and Rafter 1963; Lockerbie 1959: 82, 106).

In summary, the side-hafted adzes to which radiocarbon dates are applicable come from 11th to 16th century contexts.

CONCLUSIONS

The side-hafted adze is a specialised artefact designed for side-cutting of timber. In this role it can be regarded as essentially a canoe building tool used primarily for trimming the internal sides of a hull.

The adze type was introduced by New Zealand's early Eastern Polynesian settlers and is regarded as one of the "key fossils" for recognising New Zealand's Archaic culture. The side-hafted adze almost certainly originated in the Society or Marquesas Islands, which are regarded as the two centres from which early Eastern Polynesian culture evolved and spread. So far, however, no early prototype specimens of this adze have been recovered in these areas.

Apart from New Zealand the side-hafted adze type is found in other parts of Eastern Polynesia. Slightly differing forms are found in Mangareva (Type 5B) and Pitcairn, the Society and Tubuai Islands (Type 5C).

In New Zealand the adze type was used from earliest times of settlement through to, perhaps, the 16th century. Its use is likely to have persisted until even later times in the South Island and perhaps in some parts of the North Island, but the rise of Classic Maori culture in the North Island in about the 16th or 17th century saw the replacement of the side-hafted and other Archaic artefact types.

The many new records of localised specimens recorded in this paper demonstrate that the side-hafted adze had a New Zealand-wide distribution. However, most records are from coastal sites and inland examples are few. The predominant coastal distribution of this adze reinforces the idea that Archaic settlement was largely coastal in distribution. With the rise of Classic Maori culture in the North Island came the abandonment of specialised adze types and the adoption of a more standardised adze style (Duff Type 2B). Any need for a side-cutting adze in Classic Maori culture was possibly overcome by fitting the 2B adze to a composite haft which gave a long blade extension. More importantly, however, the whole concept of canoe building may have changed. Wide-hulled canoes with top strakes which could be adzed with conventional tools may have become fashionable, and a special adze for the cutting of vertical sides of narrow-hulled canoes was no longer necessary.

Plots of specimen distribution and lithology demonstrate that the use of two rock types – Tahanga basalt from Coromandel and metasomatised argillite from Nelson-D'Urville Island – were of primary importance. A third type, a metasomatised argillite from Southland, was of local significance. Specimens of Tahanga basalt are concentrated in the adjacent Coromandel-Auckland area while specimens of Nelson-D'Urville Island metasomatised argillite are concentrated in the Nelson-Marlborough-Kaikoura area. These regions, close to the rock sources, were important for early Archaic settlement in New Zealand, but specimens of Tahanga basalt and Nelson-D'Urville Island metasomatised argillite were traded beyond these areas, and in the case of the latter had a wide distribution in both islands. The other important area of Archaic settlement, that of coastal Otago, has produced specimens made from a range of imported and local rock types.

Statistical studies show that amongst all examples of the 5A adze studied there is a consistent relationship between length, width and thickness, and a narrow range of variation in width and thickness compared to length. The overall range in parameters, and particularly of width and thickness, is small considering the scattered origins of specimens and the different lithologies used. Thus there was a wide understanding of the proportional limits required for this specialised adze by early adze makers, and faithful adherence to a basic early Eastern Polynesian style. South Island specimens are, however, generally larger than North Island specimens.

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specimens; and Dr C. P. Wood (N.Z. Geological Survey) for assistance with the statistical analysis.

Note

1. The radiocarbon dates are from original sources and are quoted in years BP and in terms of the old half life (5570 ± 30 years), without correction, unless otherwise stated.

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