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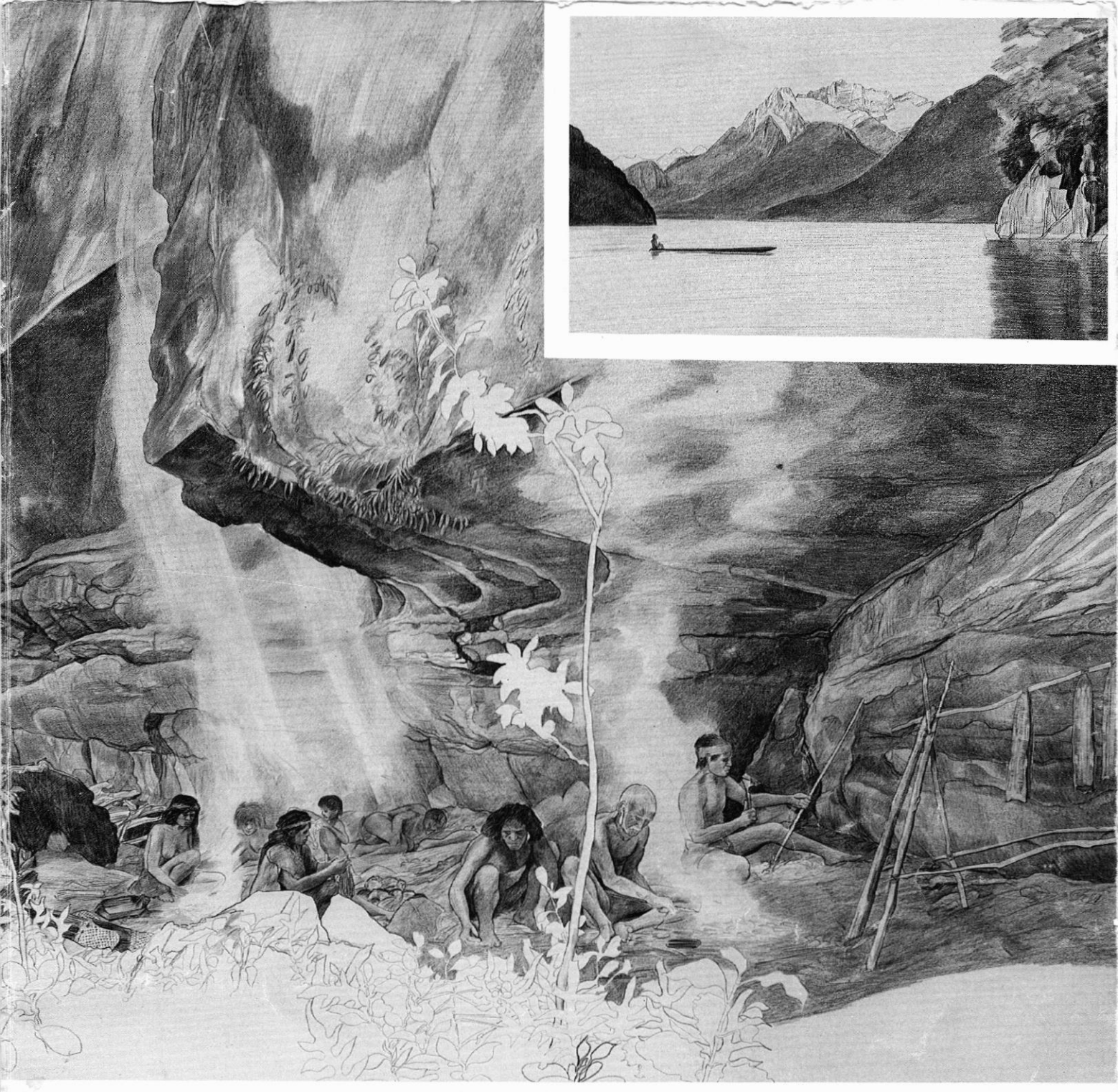
Atholl Anderson and Richard McGovern-Wilson (eds), *Beech Forest Hunters*



Beech Forest Hunters

Edited by
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New Zealand Archaeological Association Monograph 18

WOODCHIPS AND WOODEN ARTEFACTS

Atholl Anderson, Deborah Foster and Rod Wallace

Many pieces of wood, some wooden artefacts and numerous woodchips, were found in the rockshelters, especially in S131/4. Much of the wood was in the form of unmodified branches and was probably either firewood or pieces which had fallen into the sites from trees growing at the dripline, or on the slopes above the shelters. Other pieces had evidently been components of drying racks. We describe, in order, the unmodified wood and the woodchips, followed by the wooden artefacts.

WOOD IDENTIFICATION

Three of the sites contained large quantities of unmodified wood, both unburnt and partially burnt. The identifications of this material are catalogued in Table 4.1 and a summary of species abundance across all the sites is given in Table 4.2. All identifications of wood in these tables and elsewhere in the paper are by Dr Rod Wallace, Anthropology Department, University of Auckland, who employed thin-section microscopy methods. Wallace (pers.comm. 1990) notes that the totara samples could not be uneqivocally assigned to species and are assumed to be Hall's totara on the grounds of species distribution.

Most of the wood has a waterworn and abraded appearance and it probably originated as driftwood collected on the nearby shoreline, including at the waterline entrances to the rockshelters where driftwood accumulates today. If this is the case the species composition of the collection might reflect an environment wider than that of the island itself, and it could explain why three species (*Cordyline australis*, *Archeria traversi* and *Hoheria* sp.) appear that do not occur on the island today (Morrison 1983).

WOODCHIPS

Woodchips are quite a rare component of archaeological sites in New Zealand and survive only in unusually wet or dry conditions. Examples from Fiordland rockshelters have been studied by Coutts (1972), but largely from the point of view of establishing whether they were produced by stone or steel implements. So far as stone-cut chips were concerned, Coutts arrived at conclusions similar to those of McEwan (1946); i.e. they were less clean-cut or regular than steel-cut chips, and more variable in form. Boileau (1978) studied a collection of woodchips from Kohika, a wet site in the Bay of Plenty, and described six morphological types. Some experimental chopping using different types of adzes showed, however, that most woodchips thus produced belonged to her type 1; a class of chips rectangular in plan and cross-section.

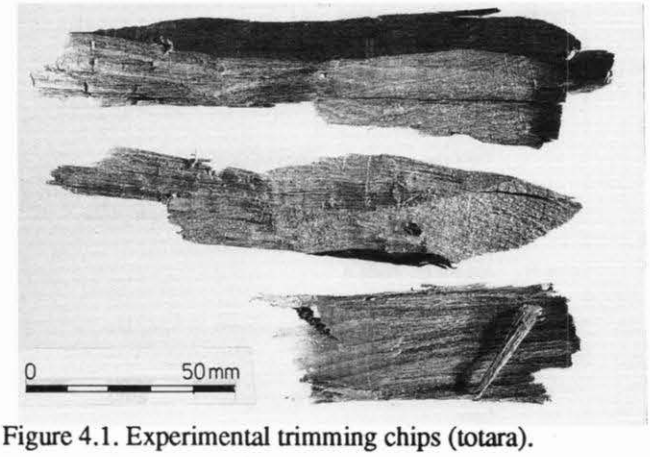

Figure 4.1. Experimental trimming chips (totara).

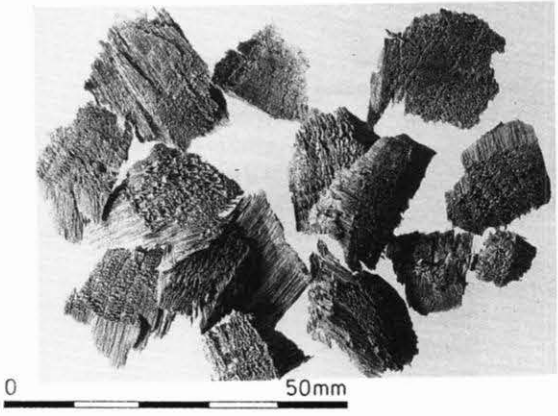

Figure 4.2. Experimental dressing chips (totara).

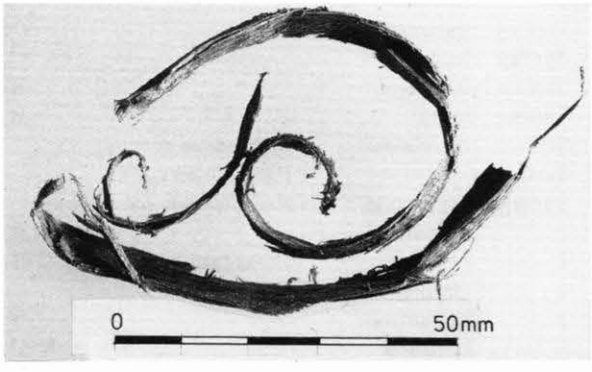

Figure 4.3. Experimental shaving chips (totara).

Foster (1983) carried out more extensive adzing experiments and her results considered in the light of earlier work, and the behavioural properties of different adzes as described by Best (1975), suggested that the most useful classification for

Table 4.1. Catalogue of wood identifications.

Note: B = partially burnt; U = unburnt.

Sq.	Layer	Common name	Scientific name	B/U
S131/4				
B-1	1	kamahi	*Weinmannia racemosa*	B
C-1	Surface	totara cf. Hall's	*Podocarpus* cf. *hallii*	B
C-1	1	pate	*Schefflera digitata*	B
C-1	1	mountain toatoa	*Phyllocladus alpinus*	B
C-1	Lens B	mountain toatoa		B
B1	1	manuka	*Leptospermum scoparium*	U
B1	1	kamahi		B
C1	1	kamahi		U
C1	1	pate		U
C1	1	beech	*Nothofagus* sp.	U
C1	1	broadleaf	*Griselinia littoralis*	U
C1	1	akeake	*Olearia avicenniaefolia*	U
C1	2	pate		B
C1	Lens B	totara cf. Hall's		B
A2	1	beech		B
A2	2		*Pseudopanax simplex*	B
B2	Surface	beech		B
B2	Surface	manuka		B
C2	1	pate		U
C2	1	broadleaf		U
C2	1	beech		B
C2	1	manuka		U
C2	2	ribbonwood	*Hoheria* sp.	U
C2	2	mountain toatoa		U
C2	2	mapou	*Myrsine australis*	U
C2	2		*Archeria traversi*	B
B3	Surface	ti	*Cordyline australis*	U
B3	Surface		*Pseudopanax colensoi*	B
B3	1		*Coprosma* sp.(*lucid.* or *foetid.*)	B
B3	1	pate		B
C3	Surface	beech		B
C3	1	beech		B
C3	1	kamahi		B
C3	1	pate		B
C3	1	mapou		B
C3	1	kowhai	*Sophora microphylla*	B
C3	1	ribbonwood		B
C3	2	pate		B
C3	2	manuka		B
B4	Surface	mountain toatoa		B
C4	Surface	kamahi		B
C4	Surface	broadleaf		B (2)
C4	Surface	beech		B (2)
C4	Surface	marbleleaf	*Carpodetus serratus*	B
C4	Surface		*Pittosporum* sp.	B
C4	Surface	lancewood	*Pseudopanax crassifolius*	B
C4	1	kamahi		B (2)
C4	1		*Pseudopanax edgerleyi*	B (2)
C4	1	akeake		B
C4	1	ribbonwood		B (2)
C4	1	broadleaf		B+U (2)
C4	1	totara cf. Hall's		B
C4	1		*Olearia* sp. (*arbor.* or *ilicifol.*)	B
C4	1	manuka		UUB (3)
C4	1	lancewood		U
C4	1	peppertree	*Pseudowintera colorata*	U
D4	1	broadleaf		B
D4	1	rimu	*Dacrydium cupressinum*	B
B5	Surface	kamahi		B (2)
B5	Surface	rata	*Metrosideros umbellata*	B
B5	Surface	mapou		B(2)
B5	Surface	manuka		B
C5	1	totara cf. Hall's		B (3)
C5	1		*Coprosma* sp. (*lucid.* or *foetid.*)	B+U (2)
C5	1	pate		U (2)
C5	1	manuka		U
C5	1	mapou		U
C5	1	totara cf. Hall's		U (4)
C5	1		*Pseudopanax colensoi*	U
C5	1	beech		B
C5	1	broadleaf		B (2)
C5	1	mapou		B
C5	1	mountain toatoa		B
C5	2	totara cf. Hall's		B
D5	Surface	mapou		B
D5	1	manuka		B (3)
D5	1	beech		B
D5	1	kowhai		B
D5	1	mountain toatoa		B
E5	2	rimu		B
C6	Surface	kamahi		B
C6	Surface	manuka		B
C6	1	manuka		B
B7	Surface	kamahi		B
C7	1	beech		B
C7	1	mapou		B
C7	2	totara cf. Hall's		B
D7	2	manuka		B
B8	2	kamahi		B
B9	1		*Olearia* sp.?	B
-A10	1	beech		B
A10	Surface	broadleaf		B
A10	Surface	pate		B
A10	Surface	rata		B
A10	1	ti		U
-A11	1	broadleaf		U
S131/4 Surface wood				
		beech		U&B (2)
		manuka		B
		broadleaf		B
		mapou		U
S131/3 Firewood				
C1	1	manuka		U
C2	2	kowhai		U
C2	2		*Coprosma* sp. (*lucid.* or *foetid.*)	UBB (3)
C2	2	beech		U
C2	2	manuka		B
C3	2		*Coprosma* sp. (*lucid.* or *foetid.*)	B
C3	2	rohutu	*Neomyrtus pedunculata*	U
S136/6				
B2	2		*Coprosma* sp. (*lucid.* or *foetid.*)	B
B2	2	manuka		B
D2	2	manuka		B
D2	2	totara cf. Hall's		B
E2	2	manuka		B
C3	2	totara cf. Hall's		B
C3	2		*Coprosma* sp. (*lucid.* or *foetid.*)	B
C3	2	marbleleaf		U
C3	2	manuka		BB
D4	2	manuka		B
C5	2		*Pseudopanax colensoi*	U
D5	2	totara cf. Hall's		B
S131/6 Surface wood				
			Coprosma sp. (*lucid.* or *foetid.*)	B
			Pseudopanax colensoi	B
		beech		B

Table 4.2. Firewood species abundance in Lee Island sites.

Note: B = partially burnt samples; U = unburnt samples.

		B	U
Leptospermum scoparium	manuka	19	10
Nothofagus sp.	beech	10	6
Podocarpus cf. *hallii*	totara cf. Hall's	6	9
Weinmannia racemosa	kamahi	11	1
Griselinia littoralis	broadleaf	4	8
Coprosma sp. (*lucida* or *foetidissima*)		10	1
Schefflera digitata	pate	6	4
Myrsine australis	mapou	6	4
Phyllocladus alpinus	mountain toatoa	5	1
Pseudopanax colensoi		3	2
Hoheria sp.	ribbonwood	3	1
Sophora microphylla	kowhai	2	2
Carpodetus serratus	marbleleaf	3	1
Olearia avicenniaefolia	akeake	2	1
Pseudopanax edgerleyi		2	-
Pittosporum sp.		2	-
Metrosideros umbellata	rata	2	-
Pseudopanax crassifolius	lancewood	1	1
Pseudopanax simplex		1	1
Cordyline australis	ti	-	2
Dacrydium cupressinum	rimu	-	2
Olearia sp. (*arborescens/ilicifolia*)		1	-
Pseudowintera colorata	peppertree	1	-
Olearia sp.?		1	-
Archeria traversi		-	1
Neomyrtus pedunculata	rohutu	-	1
	Total	101	59
		160	

the Lee Island material would define three types, as follows:

1. Trimming chip (Fig. 4.1). These reflect the early stages of timber preparation, and have a chopped and levered appearance likely to have been produced by Duff Type 2B adzes or similar implements. Adze marks on the chips indicate a high angle of attack, in which the adze blade has levered the chip off and split the wood for some distance ahead of the point of penetration.
2. Dressing chips (Fig. 4.2). These are typical of a later stage in the woodworking process, and are characteristically much smaller than the trimming chips. They have a clean-cut, 'scooped' appearance, tapering towards the edges.
3. Shaving chip (Fig. 4.3). These are shallow in depth, narrow in width and curled in appearance. They reflect the shaping or smoothing of an artefact.

Methods

Measurements of length, maximum and minimum width, and the thickness of each woodchip were taken to the nearest mm with a pair of Mitutoyo Dial calipers. All the chips were then classified into the types above. The distinction between Type 1 and Type 2 was based on whether or not the chip showed signs of leverage in the form of splitting, rather than the 'follow-through' action resulting in scooped chips. Type 1 chips were generally squared off rather than tapered at the distal end. The length measurements are not a true indication of the length of the piece of wood originally removed, as the chips were often curled or twisted. They were also examined for signs of cross grain working apparent in the adze blade impressions, since the relative definition of these striations is a good indicator of the condition of the tool edge. Another variable is the section of origin, i.e. tangential, radial or at an angle. This factor may help to ascertain which part of the log was used to manufacture an artefact, or which stage of manufacture is manifested in the chip sample.

Results

Site S131/4 produced an abundance of adzed woodchips. Most of these were of totara (Table 4.3) though small numbers of eight other species were present. The distribution of totara chips within the site is given in Figure 4.4 and for the others on Figure 4.5. A complete catalogue of the woodchips in each layer in each square of S131/4 is given in Table 4.4.

Table 4.3. Woodchip species totals (S131/4).

Totara cf. Hall's (*Podocarpus* cf. *hallii*)	993
Manuka (*Leptospermum scoparium*)	34
Kamahi (*Weinmannia racemosa*)	23
Mapou (*Myrsine australis*)	16
Broadleaf (*Griselinia littoralis*)	2
Kowhai (*Sophora microphylla*)	2
Matai (*Podocarpus spicatus*)	1
Coprosma (*lucida* or *foeditisima*)	1
Pate (*Schefflera digitata*)	1
Combined total	1073

The S131/4 woodchips mostly appear to have been cut from the tangential section, or at an angle (i.e. neither tangential nor radial). There are no indications of the burning of woodchips, possibly the the result of a well-known ritual prohibition against the burning of chips and shavings from wood-carving. Amongst others, Boultbee recorded such a tapu in Murihiku in 1827 (Begg and Begg 1979:205).

Totara chips. The distribution of totara chips in S131/4 indicates specific woodworking areas which, not surprisingly, correspond to the terraces evident in the site (see Figs. 4.4 and 4.5). There was a distinctive concentration of totara chips

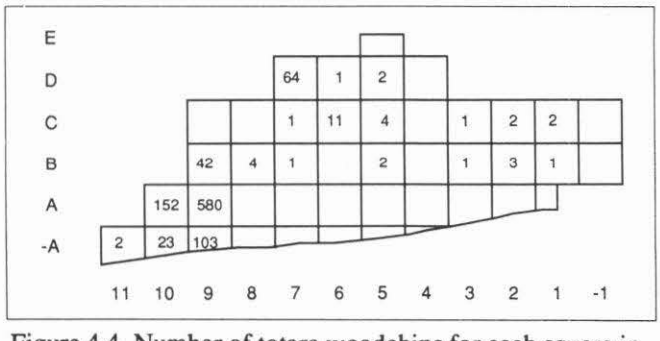

Figure 4.4. Number of totara woodchips for each square in S131/4.

Table 4.4. Catalogue of wood chips by square and layer in S131/4.

Square	Layer	No. wood chips
Totara cf. Hall's		
B1	1	1
C1	Lens B	1
B2	1	3
C2	Surface	1
C2	1	1
B3	1	1
C3	1	1
B5	Surface	1
D5	1	3
C6	Surface	1
C6	1	6
D6	1	1
B7	1	1
C7	2	1
D7	1	58
D7	2	1
B8	1	2
B8	2	1
-A9	1	33
-A9	2	70
A9	Surface	39
A9	1	515
A9	2	32
B9	1	1
B9	2	41
-A10	1	23
A10	1	152
A11	1	2
Manuka		
C1	1	2
-A9	1	1
-A9	2	30
A10	1	1
Kamahi		
C2	Surface	2
D5	1	1
A9	Surface	1
A9	1	1
-A9	1	10
-A10	1	8
Mapou		
C2	1	1
C4	1	1
C6	1	1
-A9	1	10
A9	1	1
-A10	1	1
-A11	1	1
Matai		
D5	1	1
Broadleaf		
B3	1	1
C4	1	1
Coprosma (*lucida* or *foetidissima*)		
-A9	1	1
Kowhai		
A9	Surface	1
C5	1	1
Pate		
C5	1	1

(predominantly Type 2) in the vicinity of Square A9, located on the southernmost and highest terrace, adjacent to a firepit. A smaller concentration of chips was found in Square D7. These concentrations were denoted Area A and Area B respectively (see Foster 1983:Fig.5), in order to test whether discrete stages in the woodworking process were represented. All Type 1 (n = 29) and Type 3 (n = 53) totara chips were analysed, as were all Type 2 chips over 30 mm in length (n = 167). Of 711 Type 2 chips of less than 30 mm length a sample of 100 was added. This comprised a grab sample of 80 from those in Area A (n = 650) and of 20 from those in Area B (n = 61). Because of their size, the small Type 2 chips have few diagnostic features, and the grab sample contributes essentially only data on length to the comparative analysis. The total number of chips in the two areas (960), is slightly less than the total of all totara chips (993).

The distribution of chip types (Table 4.5) indicates that trimming (Type 1) chips were relatively more numerous in Area B, where there were many fewer chips in total. Trimming chips in Area B were also longer than in Area A (Foster 1983:93), and these two observations together suggest that either different artefacts were being manufactured at the two areas, or that the early stages of manufacture were carried out in Area B, and the same artefact completed in Area A. If the artefact was a kumete (see below) the latter possibility is more likely (assuming the chips are contemporaneous). Morphological features of some of these trimming chips (Fig. 4.6) suggest a possible correlation with the hacked and frayed totara 'core'. Some of the chips appear to have been similarly hacked and are consistent with having been split from the periphery of the core.

Table 4.5. Distribution of totara woodchips by type and area in S131/4.

Note: % in brackets.

	Type			
Area	1	2	3	Total
A	6 (0.7)	796 (93.4)	50 (5.8)	852
B	23 (21.2)	82 (75.9)	3 (2.7)	108
	29	878	53	960

As can be seen in Tables 4.6 to 4.8, there is a significant difference in the thickness of the three chip types. Shavings (Type 3) are more than seven times thinner than trimming chips, and half as thick as dressing chips (Fig. 4.7); this reflects the planing action of the tool used (Fig. 4.8). The difference in maximum and minimum width is also indicative of the nature of the chip types. There is relatively little difference between the maximum and minimum width of Type 1 chips, a fact which is consistent with their chopped and levered mode of production. Types 2 and 3 are distinct in this

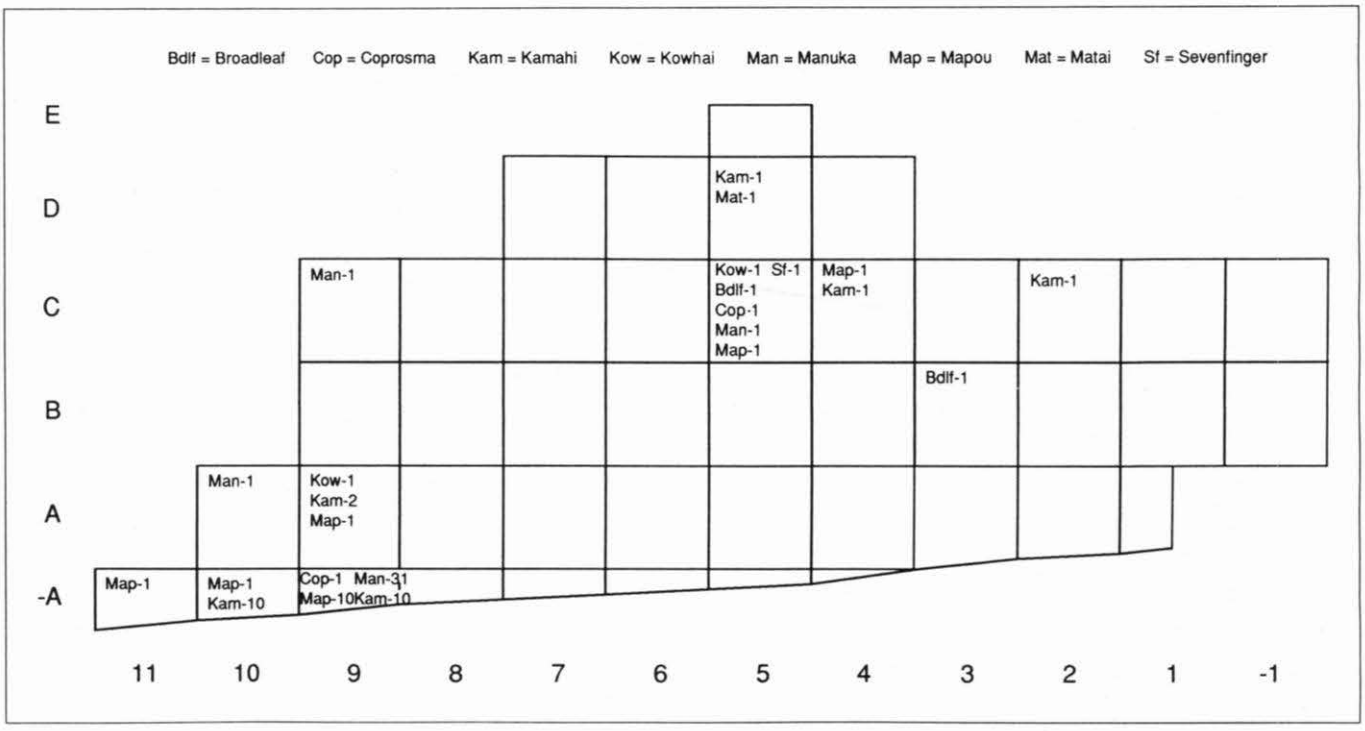

Figure 4.5. Woodchip totals per square of all non-totara chips in S131/4.

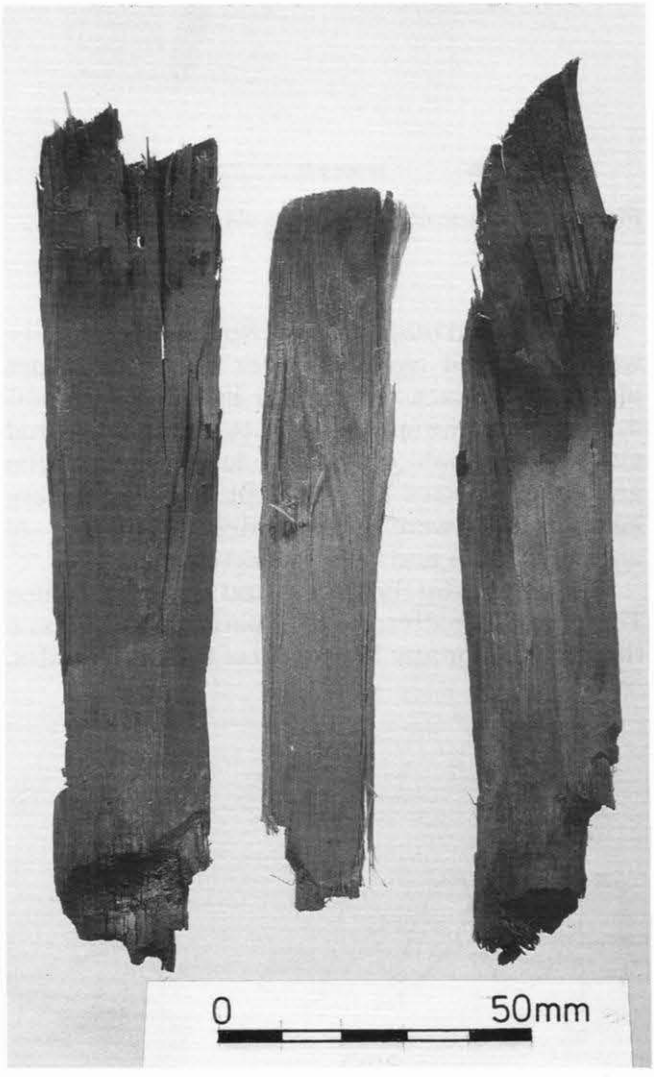

Figure 4.6. Archaeological trimming chips (totara).

Table 4.6. Summary of metrical analyses of totara woodchips less than 30 mm long: overall.

Attribute	Mean			Standard deviation		
	Type 1	Type 2	Type 3	Type 1	Type 2	Type 3
Length	21.5	17.0	11.6	0.7	6.7	5.8
Max. Width	18.0	10.5	11.6	11.3	4.3	4.4
Min. Width	17.5	6.7	8.0	12.0	3.4	3.6
Thickness	4.5	1.4	0.6	0.7	1.1	0.2
	Type 1: n = 2		Type 2: n = 100 (sample)		Type 3: n = 9	

Table 4.7. Summary of metrical analyses of totara woodchips greater than 30 mm long: overall.

Attribute	Mean			Standard deviation		
	Type 1	Type 2	Type 3	Type 1	Type 2	Type 3
Length	80.4	43.0	57.3	36.2	12.3	24.8
Max. Width	17.0	16.0	5.6	7.6	7.0	2.3
Min. Width	12.0	10.0	4.0	5.9	5.5	1.6
Thickness	4.3	2.0	0.8	2.1	1.0	0.36
	Type 1: n = 27		Type 2: n = 167		Type 3: n = 44	

Table 4.8. Summary of metrical analyses of totara woodchips: overall. Measurements in mm.

Attribute	Mean			Standard deviation		
	Type 1	Type 2	Type 3	Type 1	Type 2	Type 3
Length	76.0	33.0	49.5	38.0	16.5	28.5
Max. Width	17.0	14.0	6.6	7.6	6.5	3.5
Min. Width	12.0	9.0	4.7	6.3	5.1	2.4
Thickness	4.0	1.8	0.8	2.0	1.0	0.35
	Type 1: n = 29		Type 2: n = 267		Type 3: n = 53	

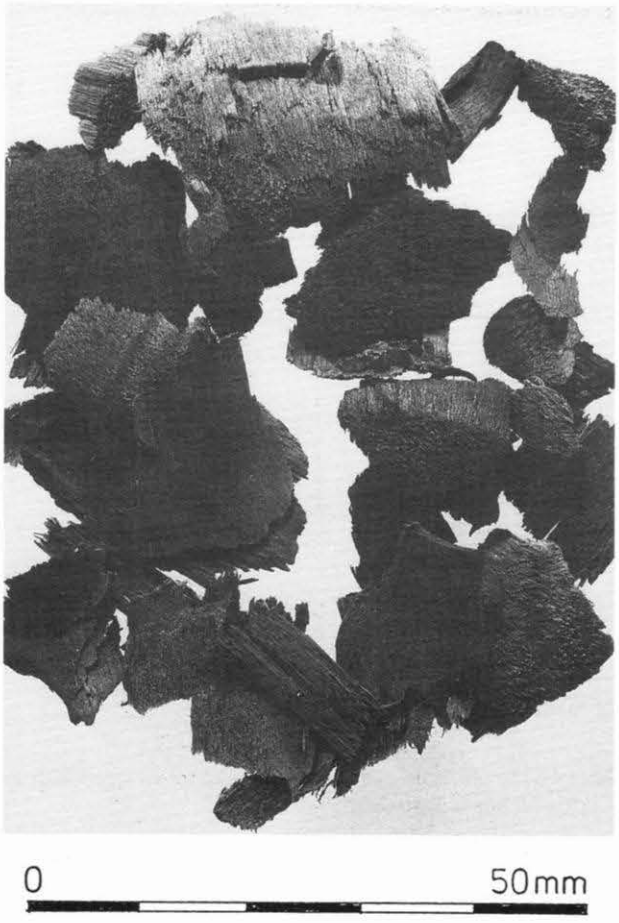

Figure 4.7. Archaeological dressing chips (totara).

Figure 4.8. Archaeological shaving chips (totara).

respect, because they characteristically taper towards the distal end.

Figure 4.9 illustrates the length distribution of the three types of chips over the whole site. There are no Type 1 chips less than 30 mm in length: the majority fall between 50 and 60 mm, and the size ranges up to 150 mm. If the sample size was larger the overall maximum length could be expected to peak at a greater length. The sample of Type 2 chips less than 30 mm (n = 100) was scaled to the total sample (n = 711) for comparative purposes. All the Type 2 chips are less than 80 mm in length, with the majority falling between 20 and 40 mm. This pattern is clearly indicative of the mode of action of the tool used and stage of manufacture: the surface was being worked with a tool which scooped the chip off to leave a smooth finish.

Manuka chips. Almost all the manuka chips (84%) were found in Square -A9, Layer 2. These chips are likely to have been produced during the manufacture of the stake found in Square D7. The majority of the trimming chips were removed from the outer surface of the wood, and are longer, wider and thicker than Types 2 and 3 (Table 4.9). All the chips appear to have been removed with the same tool.

Kamahi and mapou chips. No finished artefacts were recovered made of either of these species, although Wallace (1982:182) lists mapou (Table 4.11), among the species used to manufacture haft elements. Kamahi chips were longer overall than any other species (Table 4.10). The mapou and kamahi chips were concentrated in Squares -A9 and -A10 (55% and 80% respectively).

Kowhai, matai, broadleaf and *Coprosma* chips. There was no pattern to the spatial distribution of these chips nor any indication of the final product

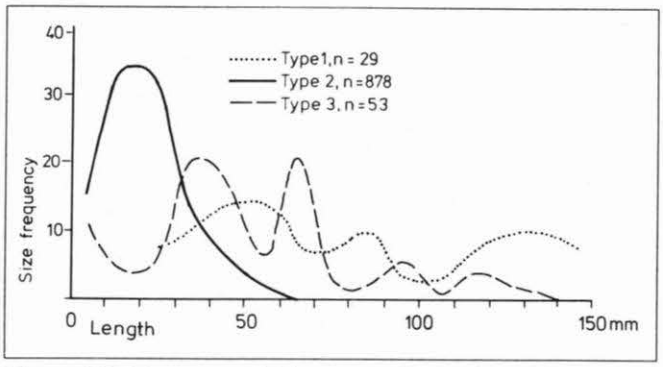

Figure 4.9. Totara woodchips: overall length distribution, by type.

Table 4.9. Summary of metrical analyses of manuka woodchips. Measurements in mm.

Attribute	Mean			Standard deviation		
	Type 1	Type 2	Type 3	Type 1	Type 2	Type 3
Length	80.0	43.0	46.0	47.0	13.0	12.0
Max. Width	16.5	14.3	8.3	5.3	3.0	2.1
Min. Width	10.5	8.0	3.6	3.3	4.7	2.5
Thickness	3.9	2.2	0.8	2.0	1.0	0.3
	Type 1: n = 11		Type 2: n = 13		Type 3: n = 4	

Table 4.10. Summary of metrical analyses of kamahi woodchips. Measurements in mm.

Attribute	Mean			Standard deviation		
	Type 1	Type 2	Type 3	Type 1	Type 2	Type 3
Length	80.0	49.7		55.0	20.3	
Max. Width	12.3	13.4		2.8	3.6	
Min. Width	7.2	7.4		3.0	2.8	
Thickness	3.4	3.0		2.0	1.1	
	Type 1: n = 5		Type 2: n = 18		Type 3: n = 0	

Table 4.11. Summary of metrical analyses of mapou woodchips. Measurements in mm.

Attribute	Mean			Standard deviation		
	Type 1	Type 2	Type 3	Type 1	Type 2	Type 3
Length	42.4	28.0		12.7	15.0	
Max. Width	13.7	9.4		4.9	3.5	
Min. Width	10.0	6.0		5.	33.1	
Thickness	4.4	2.4		1.3	1.2	
	Type 1: n = 5		Type 2: n = 14		Type 3: n = 0	

of either matai or *Coprosma*. The kowhai chips (Type 1) appear to have originated from the chopped stem found in S131/4. The two broadleaf chips (Type 2) in the assemblage may have originated from the firesticks.

Discussion of woodchips

The experimental work proved valuable in understanding the stages of woodworking which had occurred in the sites, and it suggested that there are a number of important factors which need to be taken into account, not all of which could be adequately tested in this project. These are: hafting methods (noting especially the angle of the tool in relation to the handle, and bearing in mind that composite hafts may have been utilised); the type of wood used, including its physical properties (such as the nature of the grain, hardness and durability); the type of artefact being manufactured; the stage in the woodworking process involved; the mode of tool use; and functional attributes of the tools used (manifested in adze blade impressions and chip type, for example).

The main difficulty encountered in using the typology was the subjectivity of differentiating between trimming and dressing chips. Because the phases of woodworking are continuous, in the sense that it is not possible to clearly differentiate the trimming from the dressing stage, the chip types will often vary only slightly in appearance. This, however, is a problem of relatively minor significance; trimming chips are often 'chopped and levered' in appearance, larger than dressing chips and originate from the outer surface of the wood, while shavings are easily distinguished by their curled appearance, and narrow width and thickness.

Turning to the results, the distribution of woodchips shows that the main woodworking occurred in S131/4, where the manufacture of objects in totara was the major activity. Totara woodchips are concentrated into two areas, a main one centred around Square A9 and a smaller one centred on D7. The other species present as woodchips also are found in two foci; the first also around A9 and the second around C5 near the second totara concentration. The correspondence between these concentrations suggests that the adzing of all species was part of

Table 4.12. Wood species identified as having been modified.

Key: (after Morrison 1983) r = rare; o = occasional; f = frequent; a = abundant; va = very abundant: (after Foreman 1959) branch = limb of tree or shrub; twig = small shoot or branch of tree.

Species	Description	Abundance Lee Island	Abundance Safe Cove	Chips ?
S131/3				
Coprosma lucida	poles (x2)	va	f	
or *foetidissima*		f	a	
Leptospermum scoparium	poles (x10)	f	a	
Nothofagus sp.	pole	a	a	
Phormium tenax	pole	-	o	
Phyllocladus alpinus	pole	-	o	
Pseudopanax crassifolius	pole	a	f	
S131/4				
Griselinia littoralis	firesticks and plows	a	a	y (2)
Leptospermum scoparium	stake chopped branch	f	a	y (27)
Nothofagus sp.	pole forked support (x2)	a	a	
Phyllocladus alpinus	split twig	-	o	n
Podocarpus cf. *hallii*	bowl fragment core fragment drilled plank	r	a	y (ca.1000)
Sophora microphylla	chopped and snapped stem	o	o	y (2)
Weinmannia racemosa	peg/pin	a	a	y (23)
S131/6				
Carpodetus serrata	chip peg/pin (?)	r	o	
Melicytus ramiflorus	pole forked support (x2)	f	o	
Nothofagus sp.	forked support	a	a	
Weimannia racemosa	pole	a	a	

a limited number of events, conceivably a single event. This is an important conclusion in terms of the chronology of occupation, because the distribution of woodchips (Table 4.4), shows, in addition, that there is a neat match between the abundances of chips in each layer and square with those directly above them indicating that the stratigraphy has no chronological significance in cultural terms, and that S131/4 was occupied only once.

WOODEN ARTEFACTS

The only complete wooden artefacts from the Lee Island sites were the firesticks from S131/4. The remainder were either part of a structure, or broken, burnt, worn or unfinished. The following analysis thus draws widely on the archaeological evidence, and also ethnographic evidence, as aids to interpretation. Morrison's vegetation survey of the Lee Island and Safe Cove area (Morrison 1983) was used, as well, to determine whether the species were locally obtainable and to assess the extent to which timber species were selected for a particular purpose (Tables 4.12 and 4.13). The artefacts described in the text (Table 4.14) were considered to exhibit more diagnostic features than those included in Table 4.15. The latter consist of modified pieces which were, however, not obvious artefacts.

Rack structures

The main structure, in S131/3, was first recorded by Cave (1979) at a time when it was relatively intact (Fig. 4.10). By March 1983 only two poles remained upright. The structure consisted of 16 lengths of wood, including four forked supports (see Table 4.14 for dimensions and descriptions). A reconstruction based on photographs taken in 1979 is shown in Figure 4.11.

At the time of excavation the racks in S131/4 and S131/6, described by Cave (1979), were no longer distinguishable from other wood in the sites, due to disturbance. The description of the structures

Table 4.13. Wood species identified in unmodified form.

Key: (after Morrison 1983) r = rare; o = occasional; f = frequent; a = abundant; va = very abundant: (after Foreman 1959) branch = limb of tree or shrub; chunk = short, thick piece of wood; twig = small shoot or branch of tree.

Species	Relative abundance in site	Abundance Lee Island	Safe Cove		% of sample charred
S131/3					
Dicotyledons					
Coprosma lucida or *foetidissima*	o	va f	a a	chunk branches twig	66%
Leptospermum scoparium	r	f	a	chunk branch	66%
Neomyrtus pedunculata	r	-	va	chunk	-
Nothofagus menziesii	r	-	a	chunk	-
Sophora microphylla	r	o	o	branch	-
S131/4					
Dicotyledons					
Carpodetus serratus	r	r	o	chunk	100%
Coprosma lucida	r	va	a	fragment	100%
or *foetidissima*	f	a			
Griselinia littoralis	a	a	a	twigs fragments chunk	50%
Hoheria sp.	r	-	-	twigs chunk	66%
(but present Lake Te Anau, Johnson 1972:136)					
Leptospermum scoparium	va	f	a	knots chunk twigs fragments	71%
Metrosideros umbellata	f	va	a	twig fragment	100%
Myrsine australis	f	a	a	chunks fragments twigs	55%
Nothofagus menziesii	va	-	a	twigs	40%
N. solandri var. *cliff.*		va	a	fragments	
N. fusca	r	-	-	chunk	100%
(but present Lake Te Anau, Johnson 1972:135)					
Olearia avicenniaefolia	o	o	-	fragments	100%
O. arbor. or *ilici.*	o	o	o	twigs	
Pittosporum sp.	r	f	a	fragment	100%
Pseudopanax arboreus	r	-	-	twig chunk	50%
(not Te Anau either, Johnson 1972)					
Pseudopanax colensoi	r	a	f	fragments	100%
Pseudopanax crassifolius	r	a	f	twig fragments	50%
Pseudopanax edgerleyi	r	-	o	twigs	100%
Pseudowintera colorata	r	-	a	fragments	-
Schleffera digitata	f	-	o	fragments chunk	71%
Sophora microphylla	r	o	o	fragments	100%
Weinmannia racemosa	a	a	a	fragments twigs chunks	91%
Gymnosperms					
Dacrydium cupressinum	r	a	a	fragments twigs driftwood	33%
Phyllocladus alpinus	f	-	o	fragments twig chunk	42%
Podocarpus cf. *hallii*	r	r	a	fragments	100%
Podocarpus totara	r	-	-	fragments	100%
(not Te Anau either, Johnson 1972)					
S131/6					
Dicotyledons					
Carpodetus serratus	r	r	o	chunk	-
Coprosma lucida		va	a	twig	100%
or *foetidissima*	r	f	a	chunk branch	
Leptosermum scoparium	f	f	a	brushwood twigs chunk branches	66%
Pseudopanax colensoi	r	a	f	branches split twig	50%
Gymnosperms					
Podocarpus cf. *hallii*	r	r	a	chunks	66%

Table 4.14. Wooden artefacts described in text.

Note: all dimensions of wooden artefacts described in the text are given in this table. Information about the firesticks is presented in greater detail.The artefacts are listed in the order they appear in the text. Measurements in mm.

No	Diam.	Length	Species	Comments
Rack structure S131/3				
9	50	430	*Leptospermum scoparium*	straight, charred, decayed, debarked, snapped both ends
10	25	1390	*Leptospermum scoparium*	straight, bark intact, decayed one end
11	30	1360	*Coprosma lucida* or *foetidissima*	straight, bark intact
12	20	860	*Coprosma lucida* or *foetidissima*	found surface L 2 Sq. C3, straight, snapped both ends, bark intact
B(L 2)	30	1110	*Leptospermum scoparium*	straight, bark intact, decayed one end. Adzed at base with what appears to have been single blow, then snapped. Adze cut 25mm wide max., 48 mm long, 10 mm deep
A(L 2)	20	730	*Phormium tenax* (stem)	straight, decayed, snapped both ends
Poles				
1	60	2300	*Leptospermum scoparium*	slightly curved, decayed at base, debarked
3	40	3100	*Pseudopanax crassifolius*	straight, bark intact
4	40	2320	*Leptospermum scoparium*	slightly sinuous, debarked
5	40	2820	*Leptospermum scoparium*	very sinuous, bark intact, decayed at base; adze cut at base (?) 23mm wide, 70 mm long
C(L 2)	70	2560	*Nothofagus* sp.	slightly curved, decayed, debarked, possibly adzed at one end (too worn to discern)
D(L 2)	30	2200	*Phyllocladus alpinus*	moderately curved, bark intact

Forked Supports

No.	Diam.	Length	Height to forks	Species	Comments
2	45	2300	1300 2100	*Leptospermum scoparium*	straight, snapped, uppermost fork angle may have been deliberately exaggerated
6	60	2610	1140	*Leptospermum scoparium*	possibly forked, almost straight, burnt at base, debarked
7	30	2150	1850	*Leptospermum scoparium*	sinuous, decayed at base, bark intact
8	50	1890	1690	*Leptospermum scoparium*	straight, decayed at base, bark intact

According to Cave (1979:11), the distance between the north and south supports was 3.1 m.

Rack dimensions

		Diam.	Length	Species
S131/4				
Forked supports		40	1550	*Nothofagus* sp?
		35	1370	*Nothofagus* sp?
Pole		45	5400	*Nothofagus* sp
S131/6				
Forked supports	1	25	1850	*Melicytus ramiflorus*?
	2	25	1300	*Melicytus ramiflorus*?
	3	25	1500	*Nothofagus* sp?
Poles	4	15	1550	*Melicytus ramiflorus*?
	5	35	1500	*Weinmannia racemosa*?

Firesticks S131/4

Artefact	Location	Length	Width	Thickness	Species	
Kaiure A	surface	321	19 (diam.)		*Griselinia littoralis*	well preserved; tip fits groove in kauahi C; 'shaving chip' (Type 3) impressions vary in length from 1.7 mm to entire length of stick; consistent with having been chiselled or scraped rather than adzed.
Kaiure B	coll'd 1979 from disturbed area	167	23	9.5	*Griselinia littoralis*	well preserved; tapered ends blackened through use; finely dressed adze impressions); Southland Museum 1979/56.
Kauahi C	surface	553	78	44	*Griselinia littoralis*	decayed at one end; tapers to point; thickness varies; groove 148 mm long x 8 mm wide. See Fig. 5b for features.
Kauahi D	surface C4	141	42	11	*Griselinia littoralis*	badly decayed; partly burnt; broken both ends.

S131/4

Artefact	Square	Layer	Species	Length	Width	Thickness
Drilled plank	B1	2	*Podocarpus* cf. *hallii*	107	60	13
Stake	D7	1	*Leptospermum scoparium*	263	62	47
Kowhai stem	-A9	1	*Sophora microphylla*	205	62	43
Bowl fragment	C1	1	*Podocarpus* cf. *hallii*	85	20	15
Peg/pin	C4	1	*Weimannia racemosa*	47	8	8
'Core'	-A9	2	*Podocarpus* cf.	90	36 diam.	

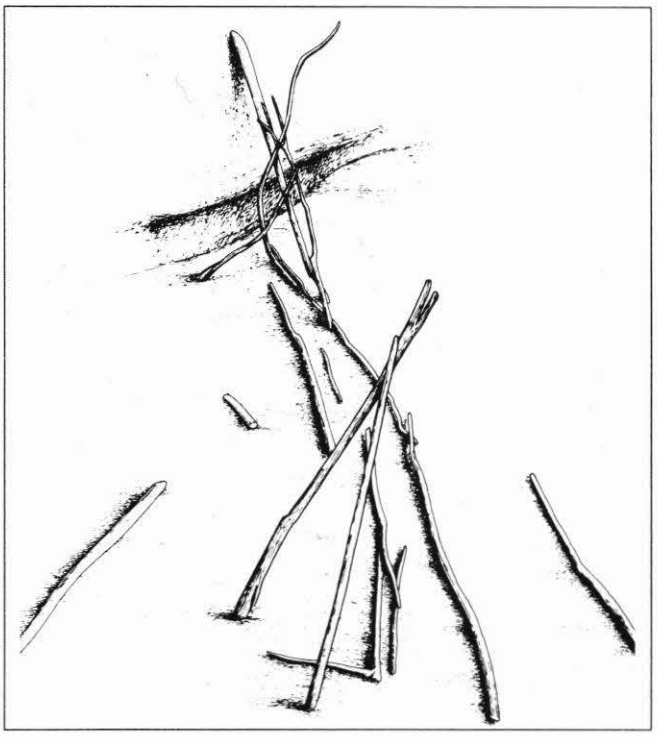

Figure 4.10. The drying rack in S131/3 as recorded in 1979.

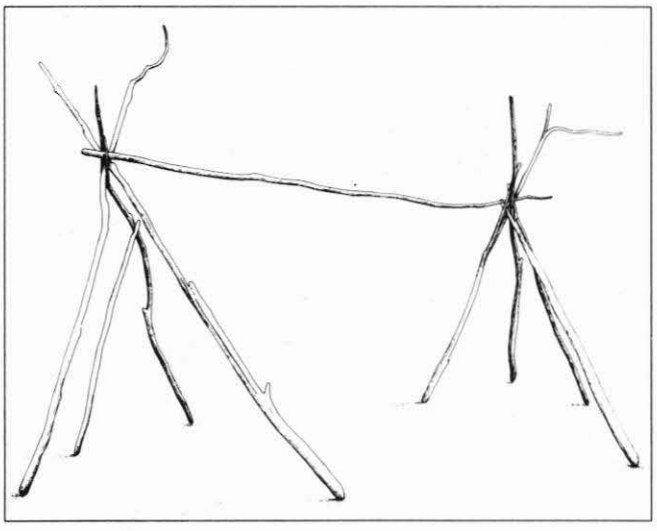

Figure 4.11. A reconstruction of the drying rack as it probably appeared in use.

is therefore based on Cave's observations (1979:7-8).

The rack in S131/4 was composed of beech and was found in a collapsed state. Only three components existed: two uprights and one long pole. When standing the long pole (5.4 m) would have been lifted to about 1 m above ground. It lay on the upper terrace of the site. It is not clear in what direction this structure would have been orientated given the dimensions of the terrace and the slope of the surface.

The rack in S131/6 had five components: three forked supports and two dressed poles ca. 1 m long.

The racks were probably used to store, dry or smoke birds or fish (Best 1929:114-115; Phillipps 1952:68). A process of this kind is described by

Table 4.15. Modified wood.

Note: the following list consists of modified wood with few diagnostic features. All the wooden artefacts which were able to provide significant information about woodworking technology have been described in the text and Table 4.14, and are not included here. Measurements in mm.

S131/3

The only modified wood in this site were the poles used in the construction of the drying rack (see Table 4.14).

S131/4

Sq	L	Species	Length	Width	Thickness
C2	2	*Podocarpus* cf. *hallii*	90	25	11
		has polished appearance possibly due to water wear (i.e. driftwood); fragment of indeterminable artefact.			
B3	1	not identifiable	44	7	4
		chip polished on 3 surfaces, adzed, origin uncertain.			
B4Surf		*Leptospermum scoparium*	113	35	35
		partially burnt both ends; bark mostly intact; a branch has been chopped from this section, possibly by a single blow; width of adze blade ca. 2 mm; adze blade used to chop this would have to be at least the width of the branch because there are no side impressions of the adze blade.			
from dist'd area		*Weimannia racemosa* collected 1979/73. Split twig; burnt at one end; possibly a tool used in process of manufacturing or processing food natural (?).	305	15	9
C-1 Lens B		*Phyllocladus alpinus* split twig, burnt at one end; perhaps intentionally split lengthways; natural (?).			
C7	2	*Podocarpus* cf. *hallii*			
		fragment, partly burnt - may have been worked, as it is quite smooth on both sides.			
B6	1	unidentifiable Gymnosperm	252	50	50
		adzed branch, very rotten; width of adze blade at least 2mm; chopped and snapped, part burnt.			

S131/6

C4	2	*Carpodetus serratus*	75	19	6
		trimming chip (Type 1) chopped and levered from outer surface of wood.			
B4	2	*Carpodetus serratus*	76	15	15
		peg/pin (?); flattens out towards tip, charred at head; appears to have been smoothed by shaving (Type 3 chips).			

Hamilton (1898:222) in the case of preserving muttonbirds in Foveaux Strait:

> "Two or three stout sticks were stuck upright firmly in the ground. On one side of each stick (pou) is cut three or four notches, deep enough to carry transverse rods (huki). The birds are spitted closely on these rods until the rods are full [the chief bones are first taken out - an operation called

makire or kohure]; the ends of the rods are then placed on the notches (kaniwha) one above the other, so that the birds may overlap or are in layers. A wooden trough or waka is placed on the ground below the birds. At one end this waka is grooved (koaka). A bright, strong, clear fire is now made in front of the hukis [sic], and as the fat from the birds melts it runs into the waka, and from it by the groove (koaka) into a kumete, or round wooden bowl buried in the ground. Then stones are made red hot, and thrown into the kumete until the fat boils. The fat is then ready to be poured into the large calabash (taha) to cover the birds which have been packed in it."

The archaeological evidence from Lee Island suggests something similar. There is the totara bark container found at S131/5, which may be compared with the 'large calabash' in Hamilton's description. In S131/4 and S131/5 there were strips of bark which could have been used to wrap poha (traditional containers made from large blades of bull kelp, *D'Urvillea antarctica*, in which cooked flesh was preserved in fat. The kelp bag was usually wrapped in a protective layer of totara bark). In S131/4 there is evidence that a wooden bowl was being manufactured. Finally, there is the rack structure from S131/3.

Firesticks

The wooden artefact assemblage from Lee Island includes two rubbing sticks (kaiure: Duff 1952:111), and two plates or bases (kauahi) which, together, were used to generate fire (Figs. 4.12 and 4.13). All four artefacts are made from broadleaf (*Griselinia littoralis*), and all were found on the surface of site S131/4 (Table 4.14). The species used is classified as a semi-hardwood (Metcalf 1972), and it occurs "abundantly" in the Lee Island/Safe Cove region (Chapter 1).

There is insufficient evidence to suggest that the fire-ploughs were manufactured on Lee Island, since only two broadleaf woodchips were identified.

An examination of Murihiku fire-sticks in the Otago Museum revealed considerable variation in form, but generally the base is a finely dressed slab of timber, roughly rectangular in cross-section. The only feature common to the rubbing sticks was the sharpened point. A more detailed study of these artefacts and the timber from which they are made may shed more light on whether a specific timber was selected for these purposes.

The method of using these implements has been described by Wade (in Best 1924:99) from observations in the Bay of Plenty district:

> "A piece of suitable wood being procured, it is held firmly down, while, with the pointed end of a smaller piece, rubbed briskly backwards and forwards, a groove is made in it. The wood dust caused by the friction is then gathered up to one end of the groove, and a sharp rubbing with the pointed stick is repeated till smoke is seen. A careful blowing will now raise sufficient fire to set light to tinder or dry litter."

This method of fire-making is consistent with the use-damage on the Lee Island specimens.

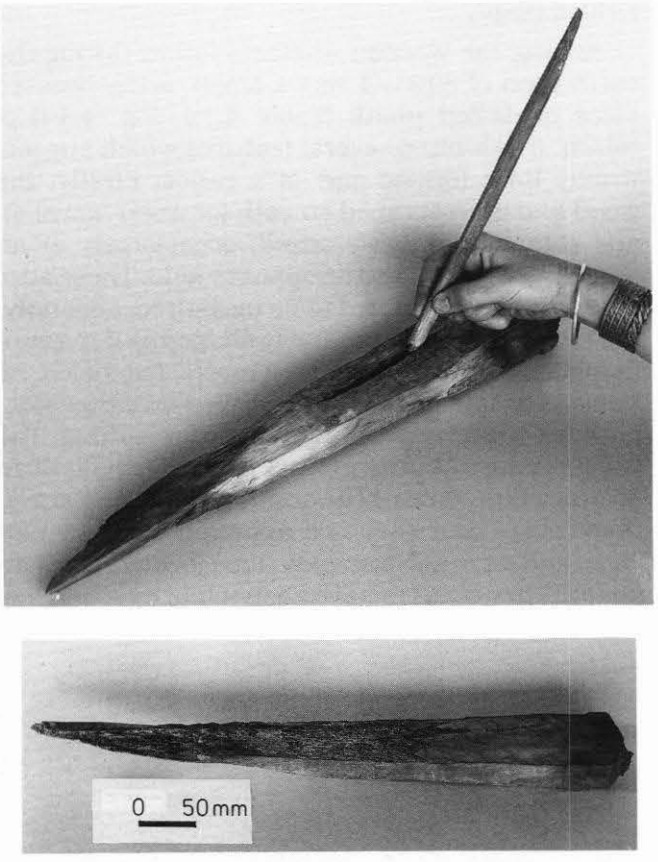

Figure 4.12. The firestick found in S131/4 in 1979. A: matching firestick (kaiure) and plate (kauahi); B: lower surface of plate showing dressing marks.

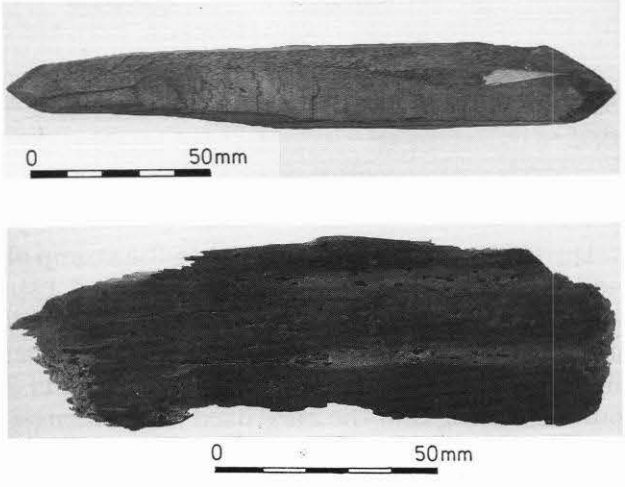

Figure 4.13. Plate (A) and firestick (B) from S131/4, Square C4, Surface.

Drilled plank

Among the wooden artefacts found during the excavation of S131/4 was a small, finely dressed piece of drilled plank (Table 4.14, Fig. 4.14) of totara. It exhibited several features which suggest it may have formed part of a canoe. Firstly, the wood had been scraped smooth (or water worn) on one side, and roughly adzed, occasionally at an angle to the grain, on the opposite side. These adze cuts were too ill-defined to be measured. Secondly, the cross-section of one end is shaped as if made to fit against a curved surface. Thirdly, two holes, 35 mm apart, had been roughly drilled on either side, perhaps to accommodate cordage for lashing. The fragile nature of the artefact makes it difficult to accurately determine the original shape and size of these holes, but they are approximately 15 mm wide and at least one may have been oblong in shape. They seem to have been made by a narrow-bladed gouge.

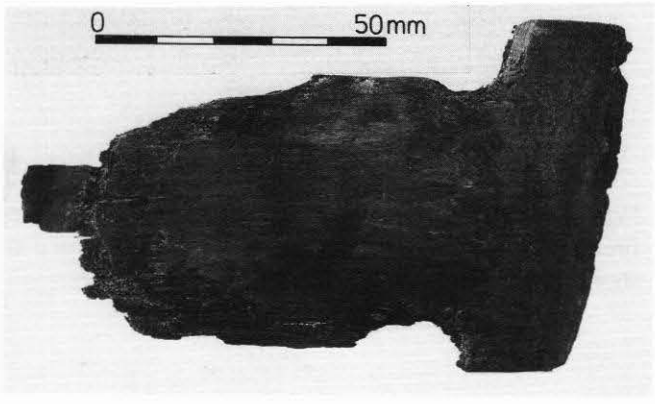

Figure 4.14. Drilled totara plank from S131/4, Square B1, Layer 2.

Stake

During the excavation of S131/4 the stump of a manuka stake was found (Fig. 4.15, Table 4.14). It was sitting upright and had been adzed to a point on three sides. Two shallow (2 mm) cut marks near the top of the stake had a maximum width of 29 mm, indicating that the adze used had a relatively small edge angle and blade width. The adze impressions on the lower portion of the artefact are consistent with both trimming chips (chopped and levered) and dressing chips (scooped). Both these chip types were represented in the archaeological assemblage of manuka, but it was not possible to match any chips to any of the adze cuts. A number of the scooped chip impressions appear to have been adzed at an angle to the grain, as were some of the archaeological manuka chips. The evidence strongly suggests that the stake was trimmed at the site.

The pointed end of the stake has a battered appearance consistent with having been hammered against stone, or an equally hard material. The opposite end is charred over the entire surface. A small amount of ash embedded in this charcoal suggests that the stake was originally longer and was burnt to ground level after it was driven into place.

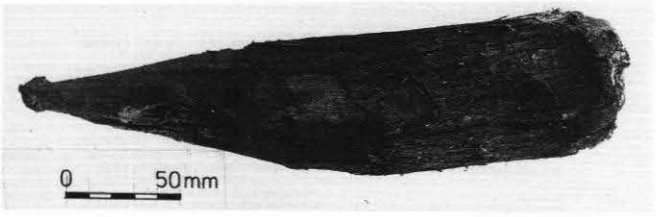

Figure 4.15. Manuka stake from S131/4, Square D7, Layer 1.

Kowhai stem

This artefact is a partly trimmed section of kowhai (Fig. 4.16, Table 4.14). It was found in S131/4 amongst a dense concentration of woodchips, although predominantly of totara (only two kowhai chips were found, suggesting that the stem was worked elsewhere). The piece had been very roughly chopped and snapped at the top end, partly trimmed down one side, and snapped off at the base. Coutts (1972) called this the "chop-around-then-snap" technique. The maximum width of any of the adze cuts is 24 mm. This artefact is probably the piece remaining from chopping a pointed stake out of a chopped and snapped kowhai branch which turned out to be slightly longer than the desired length.

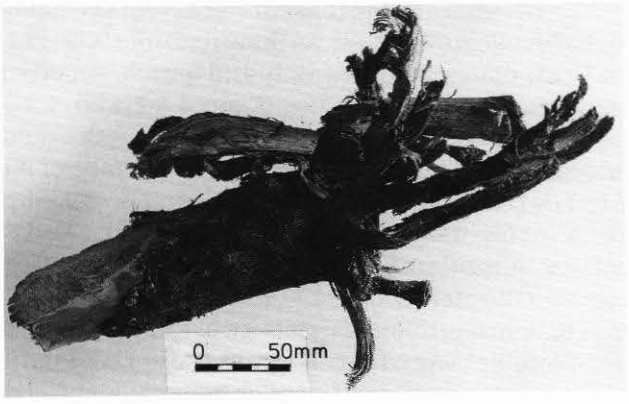

Figure 4.16. Trimmed kowhai stem from S131/4, Square -A9, Layer 1.

Probable bowl fragment

One of the most important wooden artefacts found on Lee Island, in terms of its potential for establishing some knowledge of woodworking technology, was a small fragment of a bowl or similarly shaped artefact, made from totara (Table 4.14, Fig. 4.17). There are a number of other artefacts from which this fragment could possibly have originated (e.g. canoe bailer or paddle), but a bowl is most likely. The angle of the grain relative to the surfaces of the fragment are too great for it to have been a shallow basin.

The outer surface has a smooth, scraped appearance. The numerous adze impressions on the inner surface indicate shallow cross-grain working from which one would expect small 'scooped' dressing chips. One end has a frayed appearance which could indicate that the fragment was broken from a portion of the artefact close to the roughly chopped transverse section of the log. This implies that the fragment was broken off when the artefact was in an incomplete (although perhaps functional) state.

One particularly well-defined adze impression on the inner surface measures 12.5 mm across. This corresponds perfectly with the blade width of Adze 2 found in the same site (Fig. 4.18). The adze impression is shallow (1 mm in depth), a measurement consistent with the depth one would expect from an adze such as a Duff Type 4A if used with a relatively high angle of attack.

The possibility that shrinkage of the wood may have distorted the adze cut width and depth as the artefact dried, was taken into consideration. Calculations were based on shrinkage rates for *P. totara* which differs only slightly from *P. hallii* in density and character of grain (Entrican 1934:1,7). The expected shrinkage across the width of the adze cut (i.e. the tangential section) is 0.544 mm, which is insignificant in comparison with the degree of accuracy in the measurement of adze cut impressions.

Overall, it is plausible to infer that either Adze 2 or another tool with identical blade features, was used in the manufacture of this artefact.

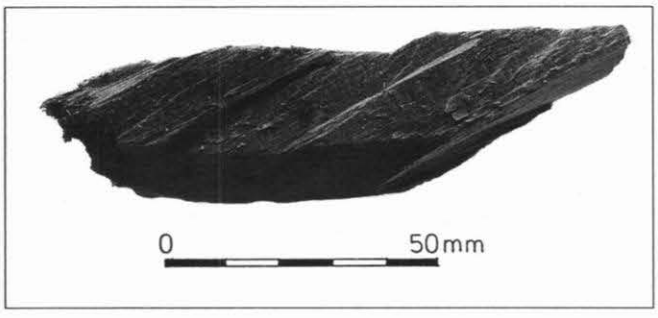

Figure 4.17. Probable bowl fragment from S131/4, Square C1, Layer 1.

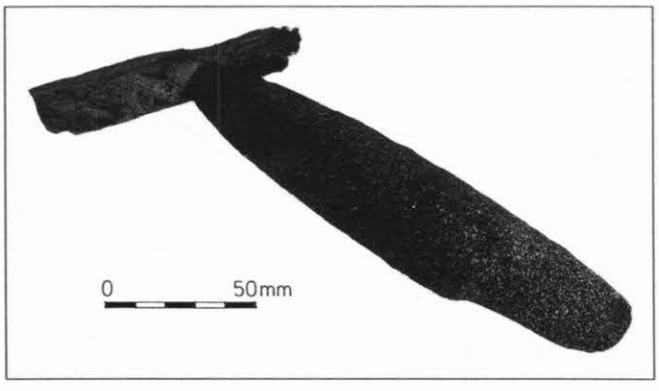

Figure 4.18. Bowl fragment and Adze 2, showing the angle of attack (based on the blade impression).

'Pin'

The end of a shaped pin or peg was recovered from S131/4 (Table 4.14, Fig. 4.19). It may have been used to secure the folded end of a bark basket as in the case of the basket found in S131/5.

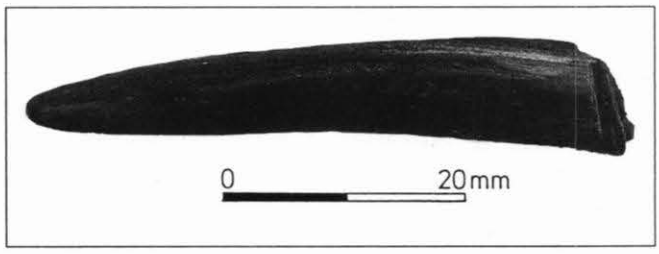

Figure 4.19. Wooden pin from S131/4, Square C4, Layer 1.

'Core'

A small core of totara was found in S131/4 (Fig. 4.20, Table 4.14). The section of wood had been removed using the "chop-around-then-snap" method (Coutts 1972). Most of the top surface bears adze cuts, apart from a 15 mm diameter area in the centre where the wood had been snapped rather than chopped. The opposite end had been snapped. None of the adze cuts around the top of the core measure more than 13 mm across, and it is possible that Adze 2, or one like it, was used to work the artefact. The fact that the core was found amongst a dense concentration of wood debitage and is of the same species as the majority of woodchips, suggests that it may have been produced during the manufacture of an artefact from which the woodchips originated, possibly a bowl.

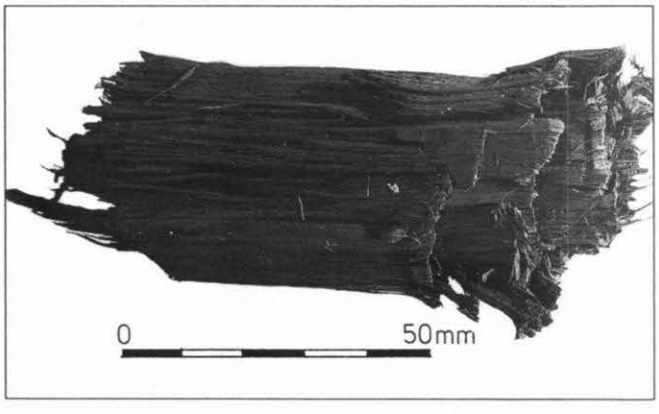

Figure 4.20. Totara core from S131/4, Square -A9, Layer 2.

DISCUSSION OF ARTEFACTS

All the timber species present in a modified form in the sites are available from either Lee Island, or in the case of mountain toatoa and silver beech, from Safe Cove nearby. Assessment of timber exploitation patterns is hindered by the limited range of identified artefacts.

The artefacts show some patterns of wood use. Totara, probably Hall's totara, was used for the carefully polished fragments of bowls etc. The fire-

making gear is made from broadleaf; a pattern previously noticed for all Southland artefacts of this type (Wallace 1985). The properties of that timber which make it suitable for this purpose are not known, although it may be that the softness of the wood (Clifton 1990:157) facilitates formation of friction grooves. The stakes are made from heavy, tough manuka which grows in convenient diameter stems for this purpose.

The wooden artefacts found at Lee Island constitute a significant part of the kind of assemblage which could be expected in a temporary fowling camp in this locality: drying racks, bowls, fire-making equipment and pegs for fastening folded bark.

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