



**NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION MONOGRAPH 17:
Douglas Sutton (ed.), *Saying So Doesn't Make It So: Essays in Honour of
B. Foss Leach***



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SAYING SO DOESN'T MAKE IT SO

PAPERS IN HONOUR OF B. FOSS LEACH

**Edited by
Douglas G. Sutton**

**New Zealand Archaeological Association
Monograph 17**

A Preliminary Study of Wood Types Used in Pre-European Maori Wooden Artefacts

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INTRODUCTION

So many highly interesting and well preserved wooden artefacts have been found in swamps that it is slowly dawning on us that our swamps are the best museums we have on this island and that Hine-i-te-Hutu, the swamp maid, is a more efficient curator than some upper world museums possess. (Best 1976: 53)

This paper is a report on the woods used to make 762 artefacts that have come from Hine-i-te-Hutu's swamps. Although wood is readily biodegradable, enough wooden artefacts have been found in New Zealand's dry caves and waterlogged soils to fill the storerooms of several upper world museums. Only a few of those artefacts are works of art. The rest are tools of everyday life. They show that wood was easily the most important raw material of the pre-European Maori. In recent years studies of the anatomy of New Zealand woods (e.g., Meylan and Butterfield 1978) have made it possible to identify the timber used to make these artefacts, to species level in most cases.

The survey reported here was carried out to supply a list of woods commonly used by the pre-European Maori. The list was used for the development of conservation techniques needed to save pre-European and some historic Maori *taonga* (Wallace 1985). The survey included a wide range of artefact types from many parts of the country. Therefore, the results are rather thinly spread geographically and typologically.

MATERIALS AND METHODS

The author visited the Auckland War Memorial Museum, Waikato Art Museum (now Waikato Museum of Art and History), Te Awamutu and District Historical Museum, the Otago Museum and the Wanganui Regional Museum. Samples were removed from selected artefacts by inserting a $\frac{1}{4}$ inch chisel into a surface fissure and levering out a small block of wood. This task was made easy by the chequered and split surfaces of many of the artefacts. The samples were taken to Waikato University where they were identified to species level in most cases.

New Zealand possesses 18 species of gymnosperms (conifers) and over 525 angiosperms (flowering plants) which are capable of producing useful wood (Meylan and Butterfield

1978: 8). It is reasonable to assume that the pre-European Maori would have been very selective in choosing from this array. The only reliable way to identify wood from ancient artefacts is by studying the woods' cell structure under the microscope. This was done by softening the wood samples in hot water and cutting thin sections with a fresh scalpel blade. The sections were cleaned of intracellular debris with 3% sodium hyperchlorite, washed and then stained with 1% Saffranin. The sections were examined with a transmitted light microscope at magnifications between 60 and 600.

Recognition of species varies in difficulty depending on the species involved and the state of preservation of the item. Recent work on wood anatomy (Meylan and Butterfield 1978; Patel 1973a, 1973b, 1973c, 1974a, 1974b, 1974c, 1974d, 1975a, 1975b, 1975c, 1978; Patel and Bowles 1978a, 1978b) has made this work practicable, at least for the more common species.

RESULTS

The results are summarised in Table 1 where 26 artefact types are plotted against 37 wood species. Separate totals are given for artefacts of each type and artefacts of each species of wood.

Adze sockets are wooden sleeves which were lashed to adze butts (Wallace 1982). *Ketu* are weeders shaped like miniature paddles (Best 1976: 65). *Kō* are digging sticks and *teka* are footrests which were lashed to *kō* (ibid.: 70–91). The term *hoto* is used here as a generic name for one-piece spade-like horticultural implements (ibid.: 47). *Kāheru* is used to refer to composite spades made with a long slim shaft which was hafted to a broad blade (ibid.: 49).

Terms used to describe wood types need some explanation. A distinction is made between wood from the trunk of the tree and branch wood. Some artefact types were made from either one or the other whereas others were made from both. Different types of wood are often produced by the same tree species. For example, normal trunk wood *kauri* (*Agathis australis*) is a soft, straight-grained timber but most of the *kauri* artefacts reported in this study were made from branch heartwood. The latter is considerably denser than the trunk wood and almost totally impregnated with a hard resin. It bears little resemblance to commercial *kauri* timber and was used for fernroot beaters, bark beaters, mauls and weapons. In contrast, horticultural implements, house timbers, carved house panels and palisade posts were made from trunk wood.

A similar situation applies to a type of *kahikatea* (*Dacrydium dacrydioides*) called *kāpara* (Best 1977: 56–7). This is a resin impregnated timber that can be found by cutting open rotten *kahikatea* logs. It was used for the spinning tops.

HOUSE TIMBERS

Sixty-four pieces were tentatively identified as coming from houses or similar structures. Fifty-four of them are from conifer woods. These are *kauri* (*Agathis australis*), *mataī* (*Prumnopitys taxifolia*), *rimu* (*Dacrydium cupressinum*), *tōtara* (*Podocarpus totara*), and *tānekaha* (*Phyllocladus* sp.). All these conifers grow to become large forest trees able to produce straight-grained, medium density timber. All are, or have recently been, economically important in the timber industry.

TABLE 1: WOODS PLOTTED AGAINST ARTEFACT TYPES

Scientific names	Common names	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
<i>Agathis australis</i>	<i>Kauri</i>	1	15		59	4	5				2					1		2		4		93
<i>Prumnopitys taxifolia</i>	<i>Matai</i>	1	2	29	9	5			5					7		1			2	6		67
	<i>Rimu/Tōtara or Kahikatea</i>	4	3	5	7	1	1	1	10								2	2				36
<i>Podocarpus totara</i> or <i>hallii</i>	<i>Tōtara</i> or <i>Hall's tōtara</i>	17	20	16				2	4			1			1	1		4		20		86
<i>Dacrydium cupressinum</i>	<i>Rimu</i>		11		2	1			8									2	5		20	49
<i>Phyllocladus</i> sp.	<i>Tānekaha</i> or <i>toatoa</i>		3	2	3	2			3			1					1					15
<i>Halocarpus kirkii</i>	<i>Monoao</i>			2					2							1				1		6
<i>Libocedrus</i> sp.	<i>Pāhautea</i> or <i>kawaka</i>				1	1											1					3
<i>Dacrycarpus dacrydioides</i>	<i>Kahikatea</i>			1																		1
<i>Prumnopitys ferruginea</i>	<i>Miro</i>																				1	3
<i>Leptospermum scoparium</i>	<i>Mānuka</i>		1	6	3		14				4	1	1		15	48		9				102
<i>Kunzia ericoides</i>	<i>Kānuka</i>				5	1		15		1	2	1		3	19	25	2	3	1			78
<i>Nestegis</i> sp.	<i>Maire</i>			2	34	6					4	3		10	6	5	1	4				75
<i>Metrosideros</i> sp.	<i>Rātā</i> and <i>pōhutukawa</i>	1			6	16		2			1	2			2	3	1		1	1		36
<i>Myrsine</i> sp.	<i>Māpou</i> (probably)				2					8						13	6					29
<i>Beilschmiedia tawa</i>	<i>Tawa</i>		3					1					2									6
<i>Laurelia novae-zelandiae</i>	<i>Pukatea</i>		5	3		2							1						1			12
<i>Vitex lucens</i>	<i>Pūriri</i>			1	4	1		4	1	1					1				2			16
<i>Hedycarya arborea</i>	<i>Porokaiwhiria</i>		1											1			4	1		2		9
<i>Dodonaea viscosa</i>	<i>Akeake</i>										4								1			5
<i>Myrtus bullata</i>	<i>Ramarama</i>								2	1									2			5
<i>Knightia excelsa</i>	<i>Rewarewa</i>			1		1																2
<i>Sophora microphylla</i>	<i>Kōwhai</i>					5		2			1											8
<i>Brachyglottis repanda</i>	<i>Rangiora</i>				1																	1
<i>Weinmannia racemosa</i>	<i>Kāmahi</i>				1																	2
<i>Carpodetus serratus</i>	<i>Putaputāwētā</i>		1													1						2
<i>Hebe</i> sp.																1						1
<i>Schefflera digitata</i>	<i>Patē</i> , sevenfinger									1												2
<i>Coprosma</i> sp.																						1
<i>Meliclytus ramiflorus</i>	<i>Māhoe</i>					1																1
<i>Ascarina lucida</i>	<i>Hutu</i>			1																		1
<i>Beilschmiedia tarairi</i>	<i>Tarairi</i>					1						1										4
<i>Pseudopanax crassifolium</i>	<i>Lancewood</i>																					1
<i>Planchonella novo-zelandica</i>	<i>Tawāpou</i>					1																1
<i>Elaeocarpus dentatus</i>	<i>Hinaiu</i>																					2
<i>Griselinia littoralis</i>	<i>Kāpuka</i>																				1	1
Totals		24	64	63	141	52	6	41	35	12	18	13	9	14	43	107	25	30	9	36	20	762

Ten timbers were made from four angiosperm woods. Of these, *pukatea* (*Laurelia novae-zelandiae*) and *tawa* (*Beilschmiedia tawa*) form large trees and are important as commercial lumber. Only *porokaiwhiria* (*Hedycarya arborea*) and *kāmahi* (*Weinmannia racemosa*) are small trees and therefore not commercial species. Artefacts which were made of the latter must have been of a light batten type.

CARVED PANELS

A total of 24 carved panels were examined. Twenty of them can be confidently assigned to a wood species. Seventeen were of *tōtara* and there was one made of each of the following species: *kauri*, *mataī*, and *rātā* (*Metrosideros* sp. probably *robusta*). *Kauri*, *tōtara* and *mataī* are not surprising choices because their use in carvings is known from the historic records (Best 1924: 238). However, *rātā* must have been difficult to carve. The artefact made from *rātā* is a *pare* from Taranaki which is now held in the Auckland Museum (Day 1983: 74 and Plate 12).

BOWLS

Sixty-three bowls and troughs were examined. The results point to a decided preference for *mataī*; 46 percent of the bowls were made of that wood. Other conifers make up a further 41 percent of the total. *Tōtara* is the most important of these. Overall, conifers were used for approximately 87 percent of the bowls with the rest made from six broadleaf woods. *Pukatea* in the north is the most notable of these. In short, pre-European Maori carvers had a very strong specific wood species preference when making bowls. Despite this, some bowls were made of other species, some of which had very different physical properties, e.g., *pukatea*, which is very soft, and *maire* (*Nestegis* sp.), which is very hard.

FERN ROOT BEATERS

Fern root beaters show an interesting pattern of wood usage (Table 2). Beaters from the Coromandel and areas to the north were almost exclusively made from *kauri*. In the Waikato, which overlaps the southern boundary of natural distribution of *kauri* (Ecroyd 1982: 23), *kauri*, although the commonest species used, accounts for only 26 percent of the artefacts. Nine other species were used in the remaining Waikato beaters, mostly the very dense angiosperms, *maire*, *mānuka* (*Leptospermum scoparium*), *kānuka* (*Kunzia ericoides*) and *rātā*. However, a range of other conifers and angiosperms are also involved. In Taranaki and Wanganui, where *kauri* was unobtainable, *maire*, *pūriri* (*Vitex lucens*) and *rātā*, which are very dense angiosperms, dominate, but again *rimu* and *mataī* were also used as substitute species.

The *kauri* used for beaters was the branch heartwood. This is approximately 24 percent denser than the trunkwood and very heavily impregnated with resin. In short, it is very hard, heavy and tough.

Key to artefact types (table 1): 1, carvings. 2, house timbers. 3, bowls, etc. 4, fernroot beaters. 5, mauls. 6, tapa beaters. 7, paddles. 8, adze helms. 9, adze sockets. 10, weapons. 11, *patu tuna*. 12, composite spade shafts. 13, composite spade blades. 14, *ketu*. 15, *kō*. 16, *teka*. 17, *hoto*. 18, spinning tops. 19, *wakahuia*. 20, combs. 21, totals.

TABLE 2
REGIONAL WOOD USE IN FERN ROOT BEATERS

	1	2	3	4
<i>kauri</i> *	43	15		
<i>mataī</i>		7	2	
<i>rimultōtara</i>		6	1	
<i>rimu</i>			2	
<i>tānekaha</i>		3		
<i>Libocedrus</i> spp.	1			
<i>mānuka</i>		5		1
<i>maire</i>		10	7	17
<i>kānuka</i>		5		
<i>rātā</i>		4		3
<i>pūriri</i>			2	1
<i>māpou</i>	2			
<i>hutu</i>		1		
<i>rangiora</i>	1			
<i>kāmahi</i>		1		
Totals	47	57	14	22

* See Table 1 for scientific names

Key: 1. North Auckland and Coromandel. 2. Waikato. 3. Taranaki. 4. Wanganui.

TAPA BEATERS

These artefacts are small beaters characterized Pacific-wide by the narrow parallel grooves running down the striking face (Buck 1962: 61–62). There were only six tapa beaters, five from the Auckland region and one from Taranaki. The five northern ones are all made of heart branch *kauri*. The Taranaki artefact was made from *rimu* or *tōtara* (see Table 1).

MAULS

The 52 mauls studied were made from 17 species of wood. Of these species, eight form ultra-dense woods. These were *kauri* (in the form of resinous heart branch wood), *mānuka*, *kānuka*, *maire*, *pūriri*, *rātā*, *kōwhai* (*Sophora* sp.) and ironwood (*Planchonella novozelandica*). These species account for two thirds of the artefacts. *Rātā* with 16 artefacts was the most popular wood. Five mauls were made from *mataī* and one each from *rimu*, *rewarewa* (*Knightia excelsa*), *māpou* (*Myrsine australis*) and *taraire* (*Beilschmiedia taraire*). The last five species all form moderately dense wood. Of the remaining six mauls, two each were made from *pukatea*, *Phyllocladus* sp., *māhoe* and *Libocedrus* sp. These seem to be unusual choices because they are light woods. However, all the mauls had been found waterlogged in swamps and it is possible that they were kept wet to increase their density, which in turn improved their usefulness. For instance, *pukatea* increases its weight by approximately 300% when saturated with water and only in the wet state would a maul made from it have been useful.

PADDLES

Thirty-four paddles were sampled. Twenty-four were of *mānuka* and *kānuka*, with the *kānuka* dominating. *Kānuka* is a much larger tree than *mānuka* and would have supplied

suitable sized wood more readily. A further seven paddles were made from *rātā*, *pūriri* and *kōwhai*, which like *mānuka* and *kānuka* yield extremely dense tough timber. In short, over 90% of the paddles were of these heavy strong woods. Three paddles, however, were made of conifer wood, either *tōtara* or Hall's *tōtara*. These woods are much lighter, softer and less strong than the others. In short, a strong pattern of wood preference is present here but there is a minor element which diverges sharply from the norm.

ADZE HAFTS

The woods used to make adze hafts and the sockets which were sometimes attached to them have been discussed elsewhere (Wallace 1982). Most hafts were made from conifer branch wood and the sockets from much heavier timber. This dominant use of conifers for hafts does not match the ethnographic records of Best (1912: 101) and Colenso (1869: 34).

WEAPONS

Eighteen weapons were sampled. All the timber species represented were extremely dense hard woods. The woods used were *kauri* (resinous heart branchwood), *mānuka*, *kānuka*, *maire*, *rātā* (or *pōhutukawa*), *akeake* (*Dodonaea viscosa*) and *kōwhai*. The need for weight, hardness and strength in clubs dictated the choice of wood types.

EEL CLUBS

Thirteen artefacts described as eel clubs (*patu tuna*) were studied. These were often casually made, light implements. Eight species of wood were represented, ranging from the very light *pukatea* to the very heavy *maire*. It seems likely that *patu tuna* were made from any wood to hand.

KĀHERU

Kāheru showed a very clear pattern of wood utilisation. Best (1976: 52) records the use of *mataī* and *maire* for the blade. Seven of the nine shafts examined in this study were made from trunk *mataī*. One was made from a stem of *mānuka* and one casually made from a stem of *porokaiwhiria*. The last was found in the Te Miro excavation (Edson 1979, artefact no. A15-104).

Of the 14 detachable *kāheru* blades, 10 were made from *maire*, 3 from *kānuka* and one from *pūriri*. These three species produce very heavy strong hard timber which, on European arrival, would have been superseded for this purpose by steel.

KETU

Ketu are small paddle-shaped weeding tools (Best 1976: 65). Forty-three *ketu* were sampled. Aside from one made from *tōtara*, all were made from four very dense heavy woods: *mānuka*, *kānuka*, *maire* and *rātā*.

KŌ

Digging sticks (*kō*) showed interesting patterns of regional variation (Table 3). Some of the variation is explained by the way in which the museum collections have been accumulated.

The Auckland Museum collection had derived, in large part, from private collections (e.g., the Frazer Collection) whereas the Taranaki one had come mainly from archaeological sites (e.g., the Warea Site). Certain woods, such as *Myrsine* sp., do not survive the rigours of burial so well as others and suffer disfiguring splitting when dried out. As a result, they are unlikely to be represented in the Auckland Museum collection. On the other hand, there are species that would have survived perfectly well, such as *maire* and *rātā*, which are present in the Taranaki collections but absent from the Auckland Museum collection. After considerable reflection, the present author feels that the pattern of wood use illustrated below in Table 3 is mainly a result of ecological variation. The regional pattern consists of a dominance of regrowth shrub species from Auckland with an increase of forest species to the south. This reflects the less complete clearance of prehistoric forest in the south compared to the north. The effects of selection practices of the different museums is felt to have been of less importance in creating the pattern shown.

TABLE 3
REGIONAL PATTERNS OF WOOD USE IN KŌ

	1	2	3
<i>Mānuka</i> *	34	6	8
<i>Kānuka</i>	15	3	9
<i>Māpou</i>			15
<i>Maire</i>	1		4
<i>Rātā</i>	1		3
<i>Pūriri</i>			1
<i>Akeake</i>	1		
<i>Putaputāwētā</i>		1	
<i>Porokaiwhiria</i>			4
<i>Hebe</i> sp.			1
<i>Miro</i>		2	
<i>Mataī</i>		1	
<i>Tōtara</i>	1		
<i>Monoao</i>	1		
<i>Kauri</i>	1		
TOTALS	55	13	45

* For scientific names see Table 1.

Key: 1. Northland to Coromandel. 2. Waikato. 3. Taranaki.

TEKA

The *teka* include at least 10 wood species in a total of 25 artefacts, indicating that there were no preferences for any particular species. One would suspect that it was the shape of the wood that was important and when a suitable piece was found it was used regardless of species or wood properties.

HOTO

Hoto, used here to refer to a category of broad-bladed one-piece, spade-like implements, present a slightly different pattern of wood use to the other digging tools. Nineteen of the 30 implements examined were made from the heavy tough hardwoods, *mānuka*, *kānuka*, *maire*, *pūriri* and *akeake*, as could be expected. However, 10 *hoto* were made from conifer

trunkwood and one from the broadleaf *pukatea*. These latter woods are much lighter and less strong than the others. This implies that at least some of these broad-bladed implements may have been used for lighter work than the bulk of prehistoric cultivation tools. Best (1976: 63) comments that such spade-like implements often appear of light construction and useful for light work among growing crops.

TOPS

Nine spinning tops were examined. Two were made from dense hardwoods, *kānuka* and *rātā*, two from *mataī*, one of the heavier conifers, one from (probably) *rimu* and four from the dense resinous heartwood of *kahikatea*, known as *māpara* or *kāpara* (Best 1977: 154–7).

WAKAHUIA

Thirty-six *wakahuia* were studied. Although the majority (20) were made from *tōtara*, the remaining 16 were of 7 different woods. Of these latter, *mataī* and *kauri* were the most common but *monoao* and *miro* were found in one item each and a further four were made from broadleaf trees. This suggests that while there was a tendency to use conifers for what were often intricately carved items, as might be expected, their small size allowed a wider range of species to be used, including some which do not form large timber bearing trees. This reinforces the impression gained with other artefact classes that although the pre-European Maori had some strong traditions of using specific woods for particular purposes, he also had a wide knowledge of the alternatives and used these sometimes unusual species surprisingly often.

HERU

One collection of *heru* (hair combs) was considered in this study. This was the collection from the Kauri Point Swamp site (Shawcross 1964) now held at Waikato Museum of Art and History. The material made available for wood identification was a selection from the large numbers of teeth that had been deliberately broken from the combs when they were deposited in the site. The teeth could not be reassigned to the heads of individual combs but represented a random sample of the wood involved. A large number of identifications were made. *Rimu* was the only species represented. The material had been subjected to conservation treatment involving impregnation by resins (Peters, pers. comm.) However, it appears that all the identified pieces were made of heart trunkwood. This identification fits well with the observation by Colenso, who noted that

Combs were made of mapara and kapara, the hard dark woody tissue, or heartwood of Rimu (*Dacrydium cupressinum*), which was assiduously sought for in the forest among old prostrate rotting rimu trees; . . . (Colenso 1869: 38)

DISCUSSION

The far right hand column of Table 1 gives an overview of the popularity of wood species used by the pre-European Maori. Several factors have distorted this general picture. The first is differential survival. Artefacts represented here have come from waterlogged environments that preserved the wood. Most have been discovered and dried out without any

conservation treatment to minimise damage on drying. This damage can range from minor cracking in sound wood to almost complete destruction in the case of highly degraded artefacts. Some woods are very resistant to decay when waterlogged but others degrade rapidly. This may well bias the results in Table 1 in favour of the durable species.

The second factor distorting the results is the geographical location of the artefacts. Unless widespread trade is present in wood as a raw material the use of geographically localised species will be limited to their areas of occurrence. *Kauri* is an example of a species available only in some areas. A consideration of its popularity as raw material for specific artefact types, e.g., carvings, must be based on larger samples of well localised objects from areas where *kauri* and alternative species are present. Only for a few artefact types, such as digging sticks and fern root pounders, are the data reported here adequate to make statements regarding geographical patterns of wood preferences. Even then some regions are not represented. Patterns of wood use over time are almost totally obscured in the data reported here since only a minority of the artefacts in Table 1 come from dated contexts.

Another factor to be considered when searching for patterns in these data is variations in the quality of the artefacts. This varies enormously, as is illustrated in the *kāheru* shafts. Seven of the nine examples shown in Table 1 were slim shafts, carefully made from trunkwood *mataī*. Two of the shafts, however, were made from whole stems of (a) *mānuka* and (b) *porokaiwhiria*. The latter shaft still had its bark on and it is very likely that it was cut from the bush, hafted to a blade, used and discarded in a shorter time than it took to make the *mataī* shafts. In short, it is likely, when considering the species used to make a class of artefacts, that the data may be a mix of careful choices, dictated by tradition and detailed knowledge of wood properties, and casual choices made to meet a momentary need. Furthermore it should be noted that a few artefact types, e.g., digging stick footrests, appear to be entirely the result of such opportunistic choices.

However, a general pattern does emerge from Table 1. This is that for each artefact type there is a short list of preferred woods. The majority of artefacts in each class are made from these preferred species. A minority, however, are made from a much wider range of species, some with properties similar to the preferred woods but some with properties that are grossly different. Examples of this are mauls, for which heavy tough woods were preferred, yet the almost balsa-like *pukatea* could also be used on occasion. Also, carved slabs are mostly of *tōtara*, with a few made from other conifers with similar properties, yet the iron-like *rātā* was used on one occasion.

In order to study wood use by the pre-European Maori properly, it will be necessary to focus on each artefact type in turn and survey museum collections comprehensively. In addition, it will be necessary to examine artefact assemblages recovered from wet site excavations. This will make it possible to study wood use in well provenanced and dated collections and to describe this feature of prehistoric culture as a property of real communities of people. Comparisons of wood use may then show local traditions or adaptations of general patterns to local environmental conditions. It is only when patterns are studied in their local context that their true significance can be approached. In short, the present study is an introduction to the study of wood utilisation patterns and it demonstrates that it is a fertile source of information on prehistoric culture patterns.

ACKNOWLEDGEMENTS

Most of this research was carried out as part of the author's doctoral research, which was financially supported by the Department of Internal Affairs.

Museum collections were made available by Steve Edson of Waikato Museum, Hamilton, Roger Fyfe of Taranaki Museum, the Board of Te Awamutu Museum, Roger Neich and Dave Simmons of Auckland Museum, Wendy Harsant of Otago Museum and Chris Jacomb of Wanganui Museum.

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