

A re-assessment of the early Māori use of silicified tuff (palla) in the Canterbury region

Phillip R Moore¹ and Michael Trotter²

¹*Peninsula Research, Waihi Beach, Bay of Plenty*

Email: peninres@xtra.co.nz

²*Tuahiwi, North Canterbury*

Email: summerwine@xtra.co.nz

Previous work has shown that a distinctive green silicified tuff, termed palla by Julius von Haast, was utilised by early Māori in the Canterbury region to manufacture small numbers of adzes. This paper presents new information on the source, composition and visual characteristics of this lithic material, along with a re-assessment of the evidence for its utilisation. A re-examination of museum collections indicates that palla artefacts were not as widely distributed as previously thought, but are largely confined to the coastal mid Canterbury area. More recent radiocarbon dating of archaeological sites near the mouth of the Rakaia River, and at Wakanui, suggest that palla was being utilised in the fourteenth century.

Keywords: Silicified tuff, palla, Surrey Hills, stone source, artefacts, Canterbury

Introduction

Among the many important discoveries made by Julius von Haast in his role as Provincial Geologist of Canterbury (1861–1876) was an outcrop of green siliceous rock on the Gawler Downs, near the North Branch of the Hinds River, where he observed “a large amount of [stone] chips lying about” (Haast 1871: 85). Haast subsequently concluded that this was the source of a number of finished and incomplete Māori adzes found in the Canterbury area, and referred to the rock type as palla, a term that apparently originated in Transylvania.

Almost a century later, Wayne Orchiston (1974, 1976) provided a more detailed account of the prehistoric exploitation of palla. He listed a total of 20 localities in the Canterbury region where adzes and other artefacts had been found, based primarily on his examination of museum collections, and considered this distinctive rock type was exploited on a limited scale for a short period in the thirteenth century. There are, however, a number of deficiencies in

Orchiston’s (1976) paper, including an almost complete lack of petrological information (despite the paper’s title), and no description of the presumed source at Surrey Hills (Gawler Downs), which it seems he did not visit. None of the artefacts were described or illustrated.

The present study had two main objectives: to inspect and sample the occurrence of palla at Surrey Hills in order to provide new information on the extent of the source, composition of the rock, and evidence of its exploitation; and to re-examine the collections held by Canterbury Museum to confirm or determine the type and geographic distribution of artefacts made of this material. In particular, we considered there was a need to update Orchiston’s (1976) list given it is 40 years since his paper was published.

Terminology

As noted above, the term palla was introduced by Haast (1871: 85) for a “green silicious [sic]

rock, occurring only on the northern side of the Gawler Downs". He also stated that he "first found it ... about seven years ago", which places his discovery at c. 1864. Haast made further reference to palla in his article on the Moa-bone Point Cave in 1874 (Haast 1874a: 77) and on his geological map of the Clent Hills District the same year (Haast 1874b). Subsequently, Cox (1877: 3) described the rock as being "variously coloured in shades of pink and green, and associated more or less with tuffaceous beds". In 1884, however, he referred to the palla as "sinter deposits", which he also reported outcropping on the north-eastern side of Mt Alford (Cox 1884: 40). By this time palla was no longer regarded as a specific rock type occurring only on the Gawler Downs, but as a more widespread geological unit.

Speight (1938:19–20) obtained a definition of palla from the 1863 year book of the Austrian Geological Survey, which broadly described it as a white, cream or greenish coloured marl or trachytic tuff found in particular parts of Austria. This led Orchiston (1976: 213) to comment that the term had been used incorrectly by Haast, although Hutton (1889: 120–121) had earlier explained how that came about: "Sir Julius von Haast told me that he had sent specimens to Vienna many years ago, and that they had been named palla by the officers of the Geological Survey of Austria". Thus Haast simply relied on the identification made by other respected geologists, and as far as he was concerned his use of the term was perfectly valid.

While palla is apparently no longer used as a geological term in Austria, or elsewhere to our knowledge, it still has some historical significance in Canterbury, and an obvious connection to Julius von Haast. Therefore we consider that the name palla should continue to be used archaeologically, with the proviso that it is restricted to the hard, mostly green, silicified tuff found at Surrey Hills. This is preferable to the more cumbersome "Gawler Downs Rhyolitic Tuff" applied by Orchiston (1976). There is no known Māori name for this rock type.

Geological context

Palla is a minor component of the Surrey Hills Tuff, which represents the basal formation of the Mt Somers Volcanics, of mid Cretaceous age (Oliver and Keene 1989). This formation is up to 50 metres thick in places but typically less than 10 metres, and consists of welded ignimbrite, tuff and tuffaceous sediments of variable induration. It is preserved only in isolated pockets. The most extensive outcrops are at Mt Alford, and other occurrences have been recorded in the Mt Somers area, the Peter Range and along the north branch of the Hinds River (Oliver 1977; Oliver and Keene 1989). At Surrey Hills the formation rests on Mesozoic greywacke and is overlain by Hinds River Dacite. The palla is probably a water-laid tuff, deposited in a shallow lake environment, and subsequently silicified as a result of later volcanism.

No other deposits of flake quality green silicified tuff similar to the Surrey Hills palla are known from the Canterbury foothills.

The Surrey Hills source

The prehistoric stone source rediscovered by Julius von Haast at Gawler Downs, on what is now part of Surrey Hills Station, was formally recorded in February 1969 by M Trotter as archaeological site S81/1 (now K36/1, www.archsite.org.nz). Trotter noted there were several outcrops of palla but that very few of the flakes and pieces associated with them showed any sign of human modification. Orchiston (1974, 1976) did not describe the site.

The source site is located in a relatively steep-sided gully, above the access road to the Gawler Downs trig. The palla occurs within the Surrey Hills Tuff, which is exposed on the south-eastern side of the gully at GPS coordinates E1468620 N5155160 (NZ Transverse Mercator projection), at an altitude of about 480 metres above sea level, and below a small knoll composed of large boulders of dacite (Fig. 1). The main outcrops cover an area of about 40



Figure 1. View to the southwest of the main outcrops of palla at Surrey Hills, March 2016. L = lower seam, M = middle (main) seam.

metres by 30 metres.

At this location the Surrey Hills Tuff is estimated to be 20–30 metres thick, and generally dips at between 20° and 40° to the northeast. It consists of interbedded coarse to fine tuff and ignimbrite with at least three distinct seams of harder silicified material (palla) ranging from about 30 cm to 3 metres in thickness. The lowest seam is 2–3 metres thick and mostly highly fractured. The main or middle seam, which is at least 2 metres thick, is of better quality and includes some larger solid blocks (Fig. 2). It consists of hard green to greenish-grey palla with minor red-brown material, some of which is finely laminated. The highest seam, further upslope, is made up of individual layers or lenses at least 30 cm thick, interbedded with coarse tuff. There is also an isolated occurrence of palla 100 metres to the

north, forming a seam about 1.6 metres thick. Overall, the outcrops extend over a distance of approximately 130 metres.

There is no obvious indication that palla was physically removed from outcrops (i.e. quarried), but given the fractured nature of the rock it is possible that suitable-sized pieces were simply prised out of the seams using wooden stakes or wedges, as has been suggested for the Nelson argillite quarries (Walls 1974: 40). Most of the loose pieces on the hillside are probably natural and likely result from freeze/thaw action during the winter months, as well as disturbance by farm animals.

Only a few of the pieces on the slope below the outcrops show any sign of having been worked. These are generally of better quality material and up to 40 cm across. One piece of green to red-brown palla found near the



Figure 2. Large in situ block of palla at Surrey Hills. Scale = 50 cm.

main seam had distinct flake scars (Fig. 3). There were only a small number of percussion flakes, and no definite preforms were seen, nor any hammer stones. This would suggest that selected pieces were transported elsewhere to be shaped into adzes.

Lithologic description

The Surrey Hills palla is a hard, tough rock that breaks with a conchoidal fracture and is easily flaked. It has a dull lustre. Fresh material is predominantly pale green in colour (5G 6/2 to 7/2), and it weathers to very pale green, pale yellowish green and light pinkish grey (colour notations according to the Munsell Soil Color Chart 2000 and Rock Color Chart 1970). Some is pale red (10R 6/2). Most palla is very fine grained (silt grade), but some is coarser and composed of darker green, angular to rounded,

fine to coarse sand-sized grains of what appear under low magnification to be altered volcanic glass. A small proportion is distinctly cherty and some pieces contain very thin, relatively straight veins of grey chalcedony. A few also display weak parallel lamination, and evidence of bioturbation (burrowing of the original soft sediment) was seen in one sample, thus supporting the idea that parts of the Surrey Hills Tuff were deposited in an aqueous environment.

No detailed petrographic study of the palla has been undertaken, but Oliver (1977: 70) reported that the fine grained tuffs are composed of up to 15% silt-sized grains of quartz and sanidine (potassium feldspar) in a matrix of glass shards and fragments. Oliver and Keene (1989) considered the more silicified rock could be termed a porcellaneous tuff.



Figure 3. Worked piece of palla (approximately 20 cm across) with large flake scars, Surrey Hills.

Chemical composition

Two samples of palla were subjected to chemical analysis by X-ray fluorescence (XRF) at the University of Canterbury, using standard procedures. One (SH3) was of bright green very homogeneous material, the other (SH6) of slightly more siliceous rock. Both samples were collected as loose pieces but probably originated from the main seam. A sample (MA1) of Surrey Hills tuff from Mt Alford was also analysed for comparative purposes. This was a very fine grained light greenish-grey porcelanite with red to orange streaks. The results are presented in Table 1.

The analyses show the palla has a relatively high silica content of about 80–81 weight per cent SiO_2 (anhydrous). It is also high in potassium (K_2O c. 7–8%), and low in Al, Na, Ca and Mg. The Fe content is variable, and

considerably higher in sample SH3. However, the green colour of the palla is not due to an unusually high iron content but to the presence of this element primarily in the ferrous state (FeO), rather than as ferric oxide (Fe_2O_3). Trace element concentrations are remarkably consistent, with only rubidium and strontium showing any significant variation in values.

One sample previously analysed from the Surrey Hills locality (also by XRF at the University of Canterbury) had a similar SiO_2 and K_2O content but higher Na, Ca and Mg values, comparable to those of other tuffs from the Mt Somers Volcanics (Oliver 1977). The sample MA1 from Mt Alford also has a very similar composition to the palla, although Al and Na concentrations are slightly higher, as are the values for some of the trace elements, particularly Sr. However, the Zr/Nb ratio is almost identical.

Identification and distribution of palla artefacts

All artefacts of palla that could be located in Canterbury Museum collections were examined. This included items previously recorded by Orchiston (1974, 1976), as well as other individually registered artefacts and those in bagged archaeological assemblages. We also inspected selected collections at Ashburton Museum and Otago Museum. A revised list of palla artefacts is provided in Table 2, while those reported by Orchiston (1974, 1976) that were unable to be re-located are listed in Table 3.

The identification of palla artefacts was based on a macroscopic examination only, under artificial light. The main criteria used to identify this material were the distinctive green colour and fine-grained texture though, as noted earlier, not all palla from the Surrey Hills source is green. In fact, most of the palla artefacts in the museum collections are greyish-green (5G 4/2). Some also show vague banding and a few contain thin veins. However, we took a conservative approach and excluded any artefacts that did not exhibit typical characteristics of palla. This included two “cores” previously recorded by Orchiston (1976) from Flemington and the Ashburton River mouth, which are composed of olive grey/red and yellowish-grey chert respectively. Although Orchiston (1976: 215) claimed that “after a little experience” the Surrey Hills palla could be readily distinguished from other green lithic materials utilised by South Island Māori, other than nephrite, it is evident from his misidentification of these two artefacts that his list could include other items that are not made from palla.

The location of both confirmed and unconfirmed finds of palla artefacts is shown in Fig. 4. Our re-examination of the collections at Canterbury Museum suggests that the palla has a more restricted geographic distribution than indicated by Orchiston (1976: fig. 1), with artefacts of this material being largely

confined to the mid Canterbury area. So far, palla has not been reported from any sites north of Christchurch (in good agreement with Orchiston 1976), and we have been unable to confirm any of Orchiston’s records from the South Canterbury coast, south of Wakanui. No palla artefacts have been identified among the Otago Museum collections from the early Waitaki River mouth site J41/56 (R Fyfe pers. comm.), or the Tai Rua site (J42/1) further south (personal observation).

Palla sites

Information on the sites where palla artefacts have been found was obtained from catalogue entries, field books, Archsite (the online database of New Zealand archaeological sites), and published records. Numbers in Table 2, figure captions and text are Canterbury Museum accession numbers (CMA) or catalogue numbers (CMC) unless otherwise indicated. Altogether, we have been able to confirm the presence of palla artefacts at only 11 localities (Table 2) – about half the number listed by Orchiston (1976).

Surrey Hills K36/1: Several pieces of palla were collected from the source site at Surrey Hills by Michael Trotter and lodged in Canterbury Museum in 1968. Some of these were natural pieces, but there were also some percussion flakes (one with secondary flaking on the edge), a core, and one item that appears to have been used as a hammer stone. They indicate that some initial shaping of blocks had been carried out on site (Fig. 3). Fig. 5 shows the piece that has been used as a hammer (bruising and chipping occur on the lower rounded point), and the flake with retouching along the bottom edge.

Rakaia River mouth L37/4: This large early Māori site near the mouth of the Rakaia River was first described by Julius von Haast in the 1870s (Haast 1870, 1871, 1879), and later by Trotter (1972a). Some detailed archaeological

Table 1. Chemical analyses of Surrey Hills palla (SH3, SH6) and Mt Alford porcelanite (MA1).

Sample	SH3	SH6	MA1
Major elements (wt%)			
SiO ₂	80.7	82.77	80.2
TiO ₂	0.06	0.05	0.08
Al ₂ O ₃	9.53	8.93	10.68
Fe ₂ O ₃ ¹	1.33	0.66	0.59
MnO	<0.01	<0.01	<0.01
MgO	0.07	0.05	<0.05
CaO	0.1	0.13	0.11
Na ₂ O	0.31	0.33	0.47
K ₂ O	7.91	7.05	7.84
P ₂ O ₅	0.02	0.02	0.02
(LOI) ²	1.17	1.28	1.44
Trace elements (ppm)			
V	7	8	11
Cr	<3	3	4
Ni	4	<3	4
Zn	19	20	30
Zr	100	96	100
Nb	16	16	16
Ba	44	43	48
La	37	36	44
Ce	77	79	84
Nd	59	60	59
Ga	19	17	16
Pb	9	12	13
Rb	295	225	275
Sr	10	15	33
Th	20	18	20
Y	5	6	4
Rb/Sr	29.5	15	8.3
Zr/Rb	0.34	0.43	0.36
Nb/Zr	0.16	0.17	0.16

¹Total iron (Fe₂O₃ + FeO), ²Loss on ignition

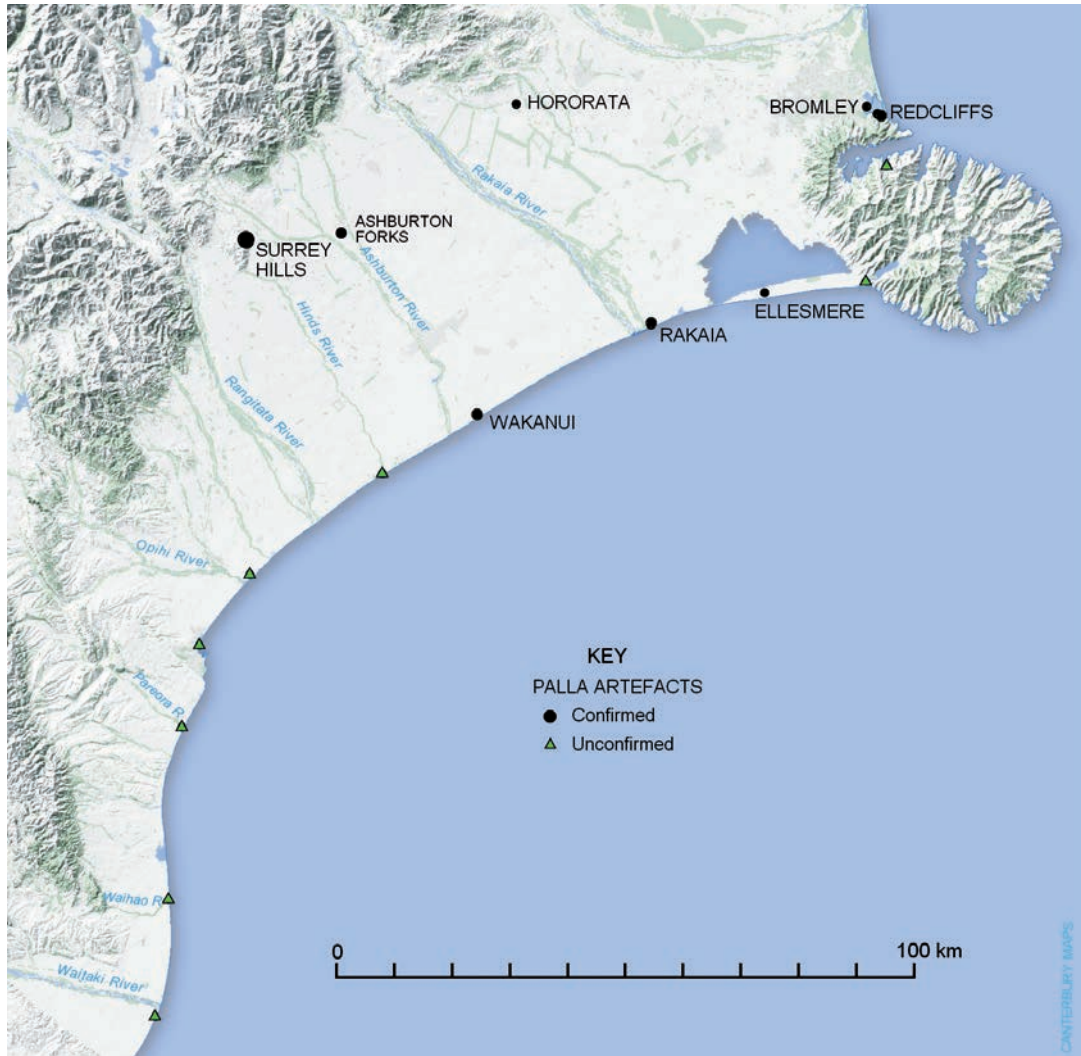


Figure 4. Map of the Canterbury region showing locations of confirmed and unconfirmed finds of palla artefacts, and the Surrey Hills source.

investigations of the site have been made more recently, particularly by Chris Jacomb (2005) and Dan Witter (2014); Witter (2008) also reviewed the archaeology of the precinct. Radiocarbon dates obtained by Jacomb (2005) on moa eggshell indicate mid-fourteenth century occupation.

Julius von Haast referred to “twenty-two pieces of roughly chipped Palla” being found at the Rakaia site by a Mr Cannon (Haast 1871: 85). An assemblage of Rakaia artefacts presented to

Canterbury Museum by presumably the same Mr Cannon does contain some flakes of palla but nothing like 22.

The material examined by us in Canterbury Museum comprised two palla adze blanks and two preforms (Fig. 6; see also Challis 1995: fig. 13), along with nine flakes (a selection of which are shown in Fig. 7). These artefacts represent only a very small proportion of the total lithic material recovered from this site.

The blanks and preforms, all of which

Table 2. List of confirmed palla artefacts.

Number ¹	Locality	Site no.	Artefact type
CMC E172.148	Surrey Hills ²	K36/1	flake
CMC E172.149	Surrey Hills ²	K36/1	saw?
CMC E172.150	Surrey Hills ²	K36/1	flake
CMC E172.151	Surrey Hills ²	K36/1	hammer
CMC E172.152	Surrey Hills ²	K36/1	piece
CMC E172.153	Surrey Hills ²	K36/1	worked piece
CMC E172.154.1	Surrey Hills ²	K36/1	flake
CMC E172.154.2	Surrey Hills ²	K36/1	piece
CMC E172.157.2	Surrey Hills ²	K36/1	piece
CMC E70.57	Rakaia River mouth	L37/4	flake
CMC E70.57.15	Rakaia River mouth	L37/4	preform
CMC E138.316.2	Rakaia River mouth	L37/4	preform
CMC E150.514.1	Rakaia River mouth	L37/4	flake
CMC E150.514.2	Rakaia River mouth	L37/4	flake
CMC E159.329	Rakaia River mouth	L37/4	adze blank
'Rakaia Haast'	Rakaia River mouth	L37/4	adze blank
CMC E165.262	Rakaia River mouth	L37/4	flake
CMA 19XX.1.2461	Rakaia River mouth	L37/4	flake
CMA 19XX.1.2462	Rakaia River mouth	L37/4	flake
CMA 19XX.1.2466	Rakaia River mouth	L37/4	flake
CMA 19XX.1.2467	Rakaia River mouth	L37/4	flake
CMA 2008.1105.10	Rakaia River mouth	L37/4	5 flakes ³
CMA 1972.140.1-56 A28	Wakanui	L37/8	2 flakes
W425	Wakanui	L37/8	broken preform
W425	Wakanui	L37/8	piece off adze
W425	Wakanui	L37/8	2 flakes
82	Wakanui	L37/8	core/piece
628	Wakanui	L37/8	flake
W632	Wakanui	L37/8	flake
W635	Wakanui	L37/8	flake
CMC E142.287	Redcliffs	M36/24	flake
CMA 2008.1108.42	Redcliffs	M36/24	12 flakes
CMA 2008.1108.45	Redcliffs	M36/24	1 flake
CMA 2008.1108.96	Redcliffs	M36/24	2 flakes
CMA 2008.1108.130	Redcliffs	M36/24	1 flake
CMC E159.217	Moa bone Point cave	M36/25	flake
CMA 2008.1092.78	Moa bone Point cave	M36/25	flake
CMA 2008.1092.82	Moa bone Point cave	M36/25	5 polished flakes
CMC E109.17.10.1	Sumner cutting ⁴	M36/22	adze/chisel
CMC E109.17.10.2	Sumner cutting ⁴	M36/22	worked piece
CMC E138.779	Avon Estuary ⁵	M35/323?	flake
CMC E159.234	Bromley	M35/323?	adze
CMC E131.18.12	Ellesmere Spit	M37/13?	adze/chisel
CMC E165.674	Ashburton Forks	—	core
CMC E177.78	Hororata?	—	adze

Ashburton Museum

¹Numbers given are Canterbury Museum accession numbers (CMA) or catalogue numbers (CMC) unless otherwise indicated. ²These are labelled in the Museum collection as "Montalto (Surrey Hills)". ³The field report for a 1967 investigation at Rakaia (Trotter 1972a: 149) noted that 48 flakes of palla were found in a surface collection made after ploughing. ⁴Part of the Redcliffs area. ⁵Probably Bromley site M35/323 or nearby. Excavated in 1965 by Canterbury Museum.

were found at or around the time of the site's discovery in the 1870s, suggest that adzes were being manufactured from palla at this site. Three of the flakes have grinding marks on them, and several also have a polished surface consistent with that caused by wood working. The grinding and polish indicate these flakes had been knapped from a finished artefact during reshaping for some other purpose. There is no obvious use wear on the sharp edges of the flakes.

Wakanui L37/8: The Wakanui site is a large 'moa hunter' site near the mouth of the Wakanui Creek. Its location is unusual since early sites are typically situated near the mouths of large rivers – in this case the nearest

river is the Ashburton, 5 km to the southwest. The Wakanui site was discovered in 1967 and salvage excavations were carried out in 1971 and 1972 (Byatt 1972; Trotter 1972b, 1973; Mosley 2010). A radiocarbon date on calcined moa bone was obtained in 1973 (Trotter 1975a) and later recalculated (Petchey 1999: 95). Although this may not be reliable by today's standards (Fiona Petchey pers. comm. August 2016), the date suggests occupation in the mid to late fourteenth century.

No detailed study has yet been made of the artefact assemblage from this site. Compared with Rakaia there are few adzes, but these and other artefacts are all of early types.

A search through the archaeological collection in Canterbury Museum provided

Table 3. List of unconfirmed palla artefacts (Orchiston 1974, 1976). Site numbers are those given by Orchiston.

Locality	Artefact type	Orchiston's source
Torlesse Range ¹	adzes	Haast 1871: 85
Redcliffs S84/76	two adzes	Southland Museum
Purau S84/8	adzes, flakes	Hovell, private communication
Birdlings Flat	adze	Hovell Collection (Christchurch)
Lake Ellesmere area	Duff 6A gouge ²	C Collett Collection (Belfast)
Rakaia River mouth S93/20	[some cited were not located – see text]	National Museum; C Collett Collection; Haast 1871: 85.
Near Hinds River mouth	flakes	Canterbury Museum
Thorngreen near Temuka	one flake	South Canterbury Museum
Greenstone Island S111/2 ³	three flakes	Canterbury Museum
Dashing Rocks S111/1 ⁴	Duff 3B adze	Mason and Wilkes 1963: 95
Pareora River mouth S119/2	Duff 2A adze, chisel, adze frags	Collett Collection
Waihao River mouth ⁵	three very small flakes	Orchiston survey
Waitaki River mouth S128/1	one flake	Otago Museum
Connolly's Seadown ⁶	?	Orchiston pers. obs.

¹ See text, ² Duff (1956: 185, 192, 389) refers to an argillite 6A gouge from Motukarara, which is on the northern side of Lake Ellesmere. ³ The Site Record for S111/2 (now K38/11) refers to an 'Island in Milford Lagoon' from which Graeme Mason presented E163.105–E163.171 to Canterbury Museum, but with no reference to palla. E163.166H in the Museum catalogue is for "Flake of palla. From Moa-hunter site at Opihi Mouth. Presented by Graeme Mason. Field collection." The nearest recorded moa hunter site to the mouth of the Opihi is Connollys (K38/13), some 2 km to the southwest. ⁴ See text. This site (now K39/1) is near Timaru. ⁵ Site record refers to Orchiston (1974). Mention is made of it on page 2.66 and in Appendix 1.3. ⁶ In his thesis Orchiston (1974: 2.66) refers to "Connolly's Seadown site" as a possible site where palla was used. This site, K38/13, is two km southwest of the mouth of the Opihi River, but there is no indication in the thesis that palla was actually found there. See Orchiston (1974: 3.21, 3.42–3.45).

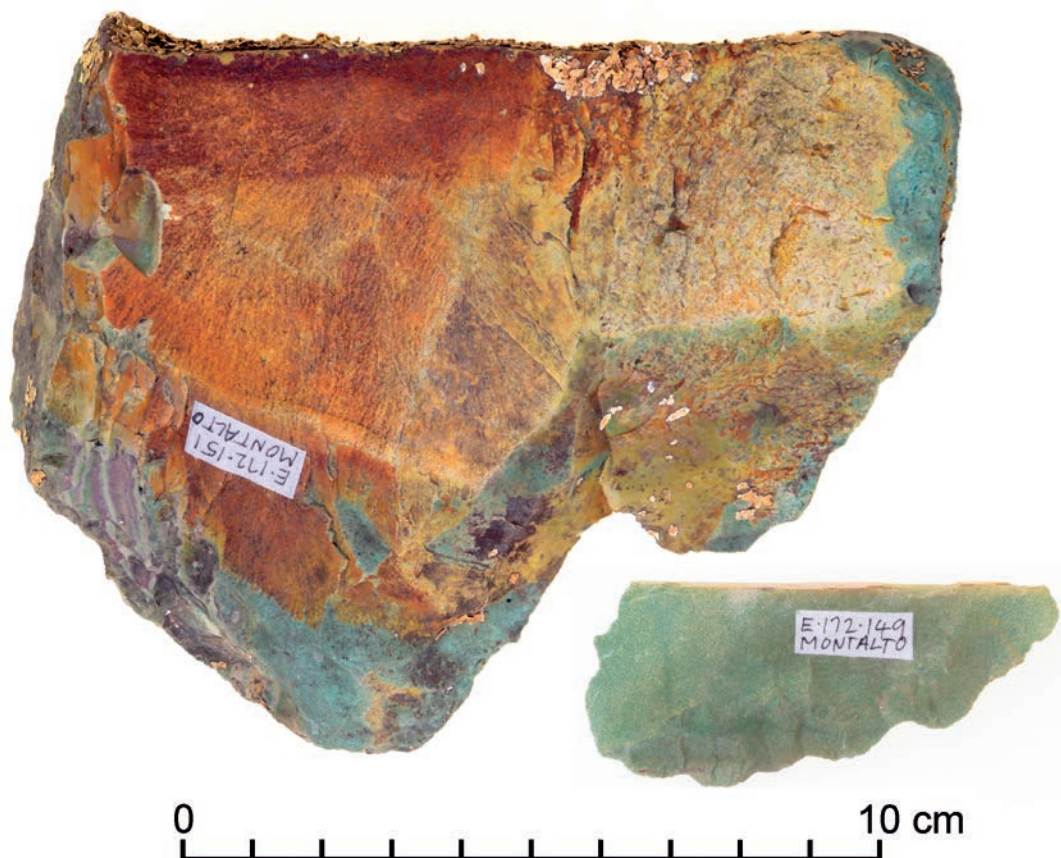


Figure 5. Piece of palla that has been used as a hammer (CMC E172.151; showing bruising on the lower rounded point), and flake with retouching along the edge (CMC E172.149), Surrey Hills.

two flakes of palla that were recovered by the Canterbury Museum Archaeological Society in 1972. Both were derived from a larger artefact such as an adze with use polish. There are another eight items from a surface collection held by the Ashburton Museum. They include a broken preform, a piece off a hammer-dressed adze, a small core and one flake with edge damage (Table 2), indicating both manufacture and use of palla artefacts.

Redcliffs M36/24 (Raekura): Raekura (Redcliffs) is another large early Māori site that was first excavated under the direction of Julius von Haast in the 1870s (Haast 1874a), though the name Redcliffs did not come into use until much later. Haast was more interested in what

was found in the adjacent Moa-bone Point Cave, but did investigate occupational deposits on the nearby sandhills. Further investigations were carried out in the late 1950s and 1960s (Trotter 1975b), leading to the proposal that parts of the site appeared to have been used for specific purposes such as the manufacture of tools from local basalt, cooking large quantities of food, or the making of bone fish-hooks and other small artefacts (Trotter 1975b: 206–207). Since then, there have been a number of investigations by various archaeologists, and several radiocarbon dates have been obtained suggesting the main occupation took place around the middle of the fourteenth century (Jacomb 2009; Trotter 2012). As well, artefact typology suggests there was minor occupation

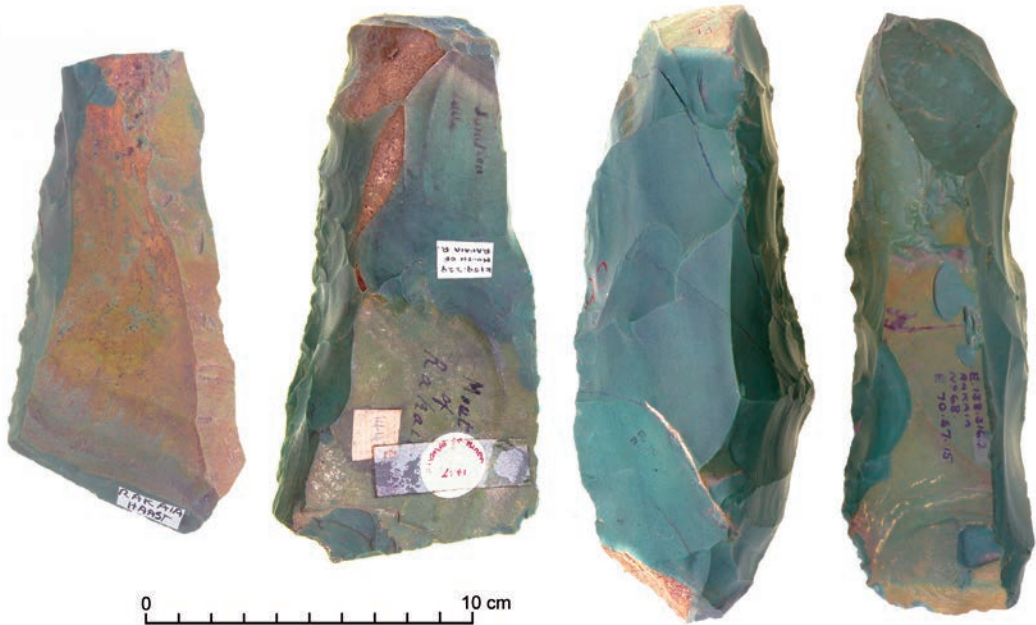


Figure 6. Palla adze blanks ('Rakaia', CMC E159.329) and preforms (CMC E138.316.2, CMC E70.57.15) from Rakaia River mouth.

of the area at a later date.

Haast (1874a: 77, 85) referred to finding two flakes of palla but these have not been re-located. There is one flake in a Canterbury Museum store room, and another 16 in the Museum's archaeological collections, all from later collections. One of these was clearly from an adze, another with hammer dressing was probably from an adze, and four had a polished surface consistent with having come from a wood-working tool. A selection of these flakes is shown in Fig. 8. There is no evidence of primary tool manufacture here, only of re-shaping of wood-working tools, probably adzes.

Two adzes from Redcliffs held by the Southland Museum could not be re-located. Orchiston (1976) provided no details on these.

Moa-bone Point Cave M36/25 (Te Ana o Hinetahi): Moa-bone Point Cave, at the northern edge of the Redcliffs flat, was another archaeological site investigated by Julius von Haast (1874a). It had long been thought that Haast's workmen

and others had completely dug the cave out but numerous patches that had been only partly dug were found during Canterbury Museum work in the late 1950s and 1960s (Trotter 1967). Because of the dry conditions within the cave it must have been a treasure-trove of discarded and cached artefacts made of perishable materials such as wood, flax, skin and hair, and while Haast recorded stratigraphy representing both 'moa hunters' and 'shellfish eaters', it had become completely mixed by the time of the later excavations.

In a Canterbury Museum store room there is one flake of palla (CMC E159.217) recorded as 'Redcliffs' but noted as being found by excavation lying on marine sand at the bottom of the occupational deposits at Moa-bone Point Cave in 1959. There are another five flakes in the Museum's archaeological collections from excavations in mixed deposits. Four of these show grinding and use polish, and one has use polish only, which indicate that they came from a completed artefact, probably an adze. Because the site has been so disturbed there is no indication of



Figure 7. Palla flakes (CMA 2008.1105.10) from Rakaia River mouth.

their original context.

Sumner Cutting M36/22: The Sumner Cutting is where the road from Christchurch to Sumner was cut through a rocky spur at the northern end of what is now known as Redcliffs. Several human burial sites were found here in 1873 (Haast 1874c). In 1958, another two burial sites were found at what was presumably the same place (Trotter 1975b: 193). Artefacts found with them were mostly of early types suggesting the burials were related to the early Redcliffs occupation.

A small adze (Fig. 9) and a worked piece of palla in Canterbury Museum are labelled "Sumner Cutting". There is, however, no record that these were associated with the burial discoveries, and it is possible that this is just an early generic name for the Redcliffs area.

Bromley; Avon Estuary (Ihutai): No exact locations are recorded for a fragment of a small adze collected from shore-edge middens at Bromley, or for a flake simply catalogued "Avon Estuary". The one archaeological site in this area for which there is some indication of the time it was occupied is M35/323, where a number of early artefacts were excavated by the Canterbury Museum Archaeological Society in the mid-1960s.

Ellesmere (Kaitorete) Spit: Part of a small palla adze or chisel in Canterbury Museum is simply attributed to Ellesmere Spit. However, the probable location provided by an informant was at, or near, site M37/13, which is recorded as an occupation layer and possible pit. Other artefacts of early type have been found in this area, including those known as the "Ellesmere Cache" (Jacomb 1994: 18–19).

Ashburton Forks: The exact location for a core of palla found in the 1960s at Ashburton Forks, some 16 km east of the Surrey Hills source, is unknown and no archaeological site has been identified with this find. The Canterbury Museum catalogue notes that "two other pieces" were also found at the same place. The core shows evidence of percussion flakes having been removed from it (Fig. 10).

Hororata: No details are recorded for a small, 109 mm long, banded palla adze in Canterbury Museum, apart from its location being given



Figure 8. Palla flakes (CMA 2008.1108.42) from Redcliffs.



Figure 9. Small palla adze (CMC E109.17.10, broken at bottom) from Sumner Cutting, Redcliffs.

as “?Hororata”. As shown in Fig. 11, it has been flaked to shape and finished by grinding.

Notes on other records (see Table 3): Julius von Haast (1871: 85) reported that a Mr John Davies Enys had found “some of the Palla adzes in the Upper Waimakariri country”. It was assumed by Orchiston (1976) that they came from the Torlesse Range, which seems highly unlikely. We have been unable to obtain any further information on these adzes, but suspect they may not actually have been made of palla.

The adze recorded by Orchiston (1976) from Methven is a Duff type 1A with a well-formed hammer-dressed butt, and appears, from the unusually short blade, to have been re-shaped. We consider it is made from green metasomatised argillite, not palla.

Orchiston’s (1974, 1976) list also includes a Duff type 3B palla adze from Dashing Rocks near Timaru. This is attributed to Mason and

Wilkes (1963: 95), but although their article describes the excavations at Dashing Rocks, neither palla nor a 3B adze are mentioned. Some of the palla artefacts from other locations listed by Orchiston (Table 3) could either not be re-located in Canterbury Museum or are in private collections.

Artefact types

Adzes: The adzes (toki) and chisels (whao) that Orchiston (1976) considered were made from palla were all, apparently, typical early forms. They included Duff types 1A, 2A (two examples), 3B (two examples), 4A and 6A; at least a further five were unclassified. It is not clear, however, how many of these adzes Orchiston actually sighted, as his list indicates that some of his information was obtained from secondary sources. The reliability of his record of a 3B adze from Dashing Rocks, for example, has already been noted above.

Of the seven definite adzes/chisels and preforms (both complete and broken) recorded by us, at least five have a triangular or sub-triangular cross-section, indicating that the main forms being manufactured from palla were Duff types 3 and/or 4. This would suggest that the rock type may have been more suited to the manufacture of these particular forms. Also, all of the adzes are small to medium in size, perhaps reflecting the size of readily-available pieces at the source. One of the preforms (E70.57.15, Fig. 6) from Rakaia has remnants of weathered cortex on the blade and butt, which tends to confirm that some adze blanks were only partly pre-prepared at the Surrey Hills source.

Flakes and core: As indicated in Table 2, flakes are by far the most common artefact type. The palla flakes held in Canterbury Museum were measured, and it was also noted whether they had come from a finished artefact or not. The width and height of flakes from the four main sites are shown in Fig. 12. For the purpose of this diagram the width is the

maximum dimension of the flake, usually but not necessarily perpendicular to the angle of the percussion strike, and the height has been measured at right angles to the width. The height/width ratio is a reflection of both the nature of the material and the particular flaking technique employed.

This plot shows a distinct grouping of smaller flakes, and a broad scatter of larger ones, but it must be acknowledged that because of selective collecting the sample will undoubtedly be biased towards larger flakes (mostly from Redcliffs and Moa-bone Point). Conversely, small flakes are probably grossly under-represented. Half

the flakes from Rakaia, Wakanui and Redcliffs (including Moa-bone Point Cave) show surface grinding or wood polish, which indicates they came from finished adzes that were being reshaped, perhaps after accidental breakage. Many of the smaller, unmodified flakes may be derived from the manufacture of preforms.

The one large core found at Ashburton Forks (Fig. 10) is 144 mm across and has a number of distinct flake scars. From its shape it seems more likely the core was used to produce flakes for cutting or scraping purposes, rather than constituting an adze blank.



Figure 10. Core from Ashburton Forks (CMC E165.674), Methven district.

Discussion and conclusions

At the outset of this study there was an expectation that we would be able to usefully add to, and perhaps significantly improve upon, the earlier work of Orchiston (1974, 1976), considering the amount of new information obtained from archaeological investigations in the Canterbury region over the past 40 years. To a degree that has been achieved, but our re-assessment has also highlighted various issues with Orchiston's list of palla artefact finds, some of which probably never will be resolved. So although a few new records have been added to the list, we have actually managed to reduce it by almost half. Thus the distribution of palla artefacts now appears to be more restricted than previously thought.

It is also evident, from the number of waste flakes with remnants of surface grinding and polish, that palla adzes were not only being manufactured at selected coastal sites, but also re-fashioned there, most notably at Rakaia and probably Redcliffs and Wakanui as well. Hence the total number of finished palla adzes produced was considerably greater than the current database would suggest.

In addition, we have obtained more reliable information on the period of palla exploitation. Although none of the palla artefacts come from a directly dated occupation layer, the majority are from large early (moa hunter) sites for which the typology of a range of artefact types is consistent with early occupation. More recent radiocarbon dates for the Rakaia and Redcliffs sites, and also Wakanui, indicate that the palla was being utilised somewhat later than estimated by Orchiston (1976), in the mid fourteenth century, which means the Surrey Hills source could have been discovered in the late thirteenth or early fourteenth century.

We are also inclined to disagree with Orchiston's (1976: 217) view that the use of palla quickly fell out of favour because of the remote location of the source (about 50 km inland) and "comparatively difficult access". On the contrary, it is likely that early settlers



Figure 11. Palla adze (CMC E177.78) from ?Hororata.

living along the coast made relatively frequent excursions into the Canterbury foothills to search for and exploit available resources, which is presumably how the outcrops were first discovered. We consider there are more compelling reasons for the limited use of palla, including ready access to superior Nelson metasomatised argillite, and to local basalt, and perhaps also the restricted size of the resource at Surrey Hills.

On the whole, however, we agree with the broader conclusions reached by Orchiston (1976), that the palla was exploited only on a limited scale within the Canterbury region, mainly for the manufacture of adzes, and probably for a relatively short period. There is also a possibility that the use of this lithic material was restricted to a single community occupying the mid Canterbury coast.

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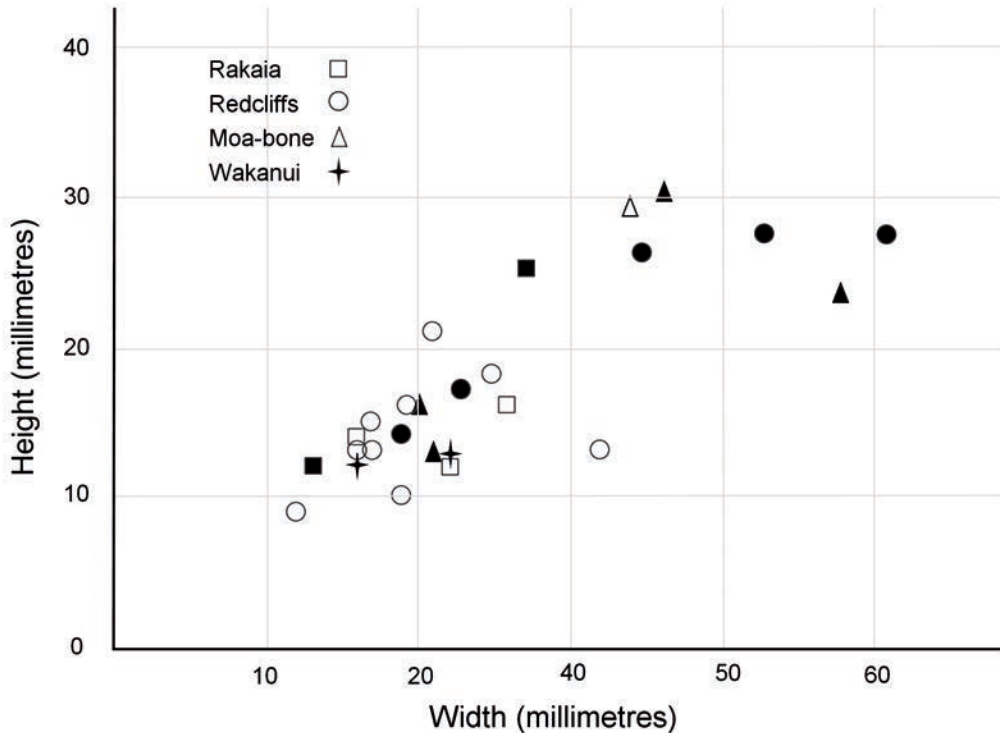


Figure 12. Size of palla flakes from the four main sites. Solid symbols = knapped from finished adzes; open symbols = no indication of grinding or polish.

References

- Byatt L. 1972. Wakanui field-work. Canterbury Museum Archaeological Society Newsletter 26: 1–3.
- Challis AJ. 1995. *Ka Pakihi Whakatekateka o Waitaha: The Archaeology of Canterbury in Maori times*. Wellington: Department of Conservation.
- Cox SH. 1877. Report on the geology of the Mount Somers district. Reports of Geological Explorations, New Zealand Geological Survey, 1876–1877(10): 1–10.
- Cox SH. 1884. On Mount Somers and Malvern Hills district. Reports of geological explorations, New Zealand Geological Survey, 1883–1884 (16): 22–43.
- Duff R. 1956. *The Moa-hunter Period of Maori Culture*. Wellington: Government Printer.
- Haast J. 1870. Letter on the discovery of cooking-pits and kitchen-middens in Canterbury Settlement, Middle Island, New Zealand. Proceedings of the Zoological Society 1870 (4): 53–57.
- Haast J. 1871. Moas and moa hunters. Transactions of the New Zealand Institute 4: 66–107.
- Haast J. 1874a. Researches and excavations carried on in and near the Moa-bone Point Cave, Sumner Road, in the Year 1872. Transactions of the New Zealand Institute 7: 54–85.
- Haast J. 1874b. Notes on the geology of the Clent Hills and Mount Somers districts, in the province of Canterbury. Reports of geological explorations, New Zealand Geological Survey, 1872–1873 (8a): 1–19.
- Haast J. 1874c. Notes on an ancient native burial place near the Moa-bone Point, Sumner. Transactions of the New Zealand Institute 7: 86–91.
- Haast J. 1879. *Geology of the Provinces of Canterbury and Westland, New Zealand*. Christchurch: Times Office.
- Hutton F. 1889. The eruptive rocks of New Zealand. Journal and Proceedings of the Royal Society of New South Wales 23: 102–156.
- Jacomb C. 1994. The archaeology of Waihora/Lake Ellesmere. In: Davies JDG, Galloway L, Nutt AHC, editors. *Waihora/Lake Ellesmere: Past-present-future*. Lincoln: Lincoln University Press and Daphne Brasell Associates; p. 17–20.
- Jacomb C. 2005. A fourteenth-century house from the Rakaia River Mouth, Canterbury, New Zealand. *Archaeology in Oceania* 40: 91–105.
- Jacomb C. 2009. Excavations and chronology at the Redcliffs Flat site, Canterbury, New Zealand. *Records of the Canterbury Museum* 23: 17–30.
- Mason GM, Wilkes O. 1963. Dashing Rocks, Timaru – A preliminary note on excavations – site S111/1. *New Zealand Archaeological Association Newsletter* 6(2): 95–98.
- Mosley B. 2010. Coming out of the basement: excavating the documentary context of the Wakanui archaeological assemblage. *Records of the Canterbury Museum* 24: 1–12.
- Oliver PJ. 1977. *The Mesozoic geology of the Mt Somers area, Canterbury, including geochemical and paleomagnetic studies of the Cretaceous calc-alkaline Mt Somers Volcanics*. [PhD thesis]. Christchurch: University of Canterbury.
- Oliver PJ, Keene HW. 1989. Mt Somers. Geological map of New Zealand 1:50,000 Sheet K36AC and part Sheet K35. Wellington: New Zealand Geological Survey, DSIR.
- Orchiston DW. 1974. *Studies in South Island New Zealand prehistory and protohistory*. [PhD thesis]. Sydney: University of Sydney.
- Orchiston DW. 1976. Petrological studies in South Island New Zealand prehistory—1. Maori use of Gawler Downs rhyolitic tuff. *Journal of the Royal Society of New Zealand* 6: 213–219.
- Petchey FJ. 1999. Bone dating revisited; a radiocarbon discard protocol for bone. *New Zealand Journal of Archaeology* 19 (1997): 81–124.
- Speight R. 1938. *The geology of the Mount Somers district*. Wellington: Department of Scientific and Industrial Research.
- Trotter M. 1967. Investigations of a Moa-Hunter site at Redcliffs, Sumner. *Records of the Canterbury Museum* 8: 251–254.
- Trotter M. 1972a. A Moa-Hunter site near the mouth of the Rakaia River, South Island. *Records of the Canterbury Museum* 9: 129–150.
- Trotter M. 1972b. Ashburton prehistory. In: Scotter WH. *Ashburton – A History of Town and Country*. Ashburton Borough and County Councils; p. 339–341.

- Trotter M. 1973. Prehistoric sites in the Ashburton District, South Island. New Zealand Archaeological Association Newsletter 16(4): 137–142.
- Trotter M. 1975a. Radiocarbon dates for Wairau Bar and Wakanui, South Island. New Zealand Archaeological Association Newsletter 18(2): 90–91.
- Trotter M. 1975b. Archaeological Investigations at Redcliffs, Canterbury, New Zealand. Records of the Canterbury Museum 9: 189–220.
- Trotter M. 2012. Archaeological report on sewer main installation at Redcliffs, Christchurch. Report for Fulton Hogan, SCIRT, and the New Zealand Historic Places Trust.
- Walls JY. 1974. Argillite quarries of the Nelson Mineral Belt. New Zealand Archaeological Association Newsletter 17(1): 37–43.
- Witter D. 2008. The archaeology of the Rakaia River mouth Moa Hunter site precinct. Report for Opus International Consultants and the Selwyn District Council.
- Witter D. 2014. 7 Ocean View Place, Rakaia Huts archaeological monitoring report. Report for Peter Dellaca and the New Zealand Historic Places Trust.

