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Tangiwai at Piopiotahi: An Account of its History and Use

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Both nephrite and tangiwai (tangiwaite or bowenite) are included in the term pounamu, which in the past was often referred to as greenstone by Europeans. Nephrite is tougher and more durable than tangiwai, a stunning and rare variety of antigorite serpentine. The best quality tangiwai is found in a very remote part of the southwest coast of Te Wai Pounamu (the South Island), Aotearoa New Zealand. Its exquisite beauty and the challenges involved in retrieving tangiwai meant that it was highly prized and eagerly sought after by Māori.

This article provides details of the physical properties of tangiwai, summarises details of its recovery and examines its availability, particularly during the post-contact period. The exploits of the Milford Sound Greenstone Company are detailed.

The challenges associated with retrieving tangiwai from its isolated source means that it was always scarce and typically there are few tangiwai taonga (treasures) in museum collections where it is heavily outnumbered by taonga made from nephrite. Illustrations of Canterbury Museum's modest collection of tangiwai taonga are provided in a brief catalogue.

Keywords: Anita Bay, bowenite, Milford Sound, pounamu, takiwai, tangiwai

What is Tangiwai?

Tangiwai is part of a group of rocks known as pounamu, a term which encompasses nephrite and tangiwai, both of which were important to Māori and which they recognised as geologically and functionally different. Nephrite is incredibly tough and can hold a very sharp edge, making it extremely useful for tools and weapons. Nephrite is found in at least 22 countries but that found in Aotearoa is known for its quality and translucence. The discovery of a goldfield in Central Westland in the mid-1860s led to an influx of Europeans and subsequently to the commercial exploitation of nephrite from the district. This led to the development of products made from the nephrite variety

of pounamu, often jewellery, which continues to this day.

Tangiwai (also known as bowenite) is a variety of antigorite serpentine. It is softer and more easily fractured than nephrite so is not as useful for tools, but its beauty made it very popular for personal adornment. Tangiwai is stunningly translucent to transparent but can also be fibrous and flaky (Beck et al. 2010: 191) with the asbestos-like fibres sometimes being quite noticeable (Fig. 1). Tangiwai varies in colour with hues of green, blue, brown and grey as can be seen in Figures 2, 3 and 4 and in the catalogue.



Figure 1. A long piece of unpolished tangiwai that shows its tendency to fracture and flake. Canterbury Museum ZM1197



Figure 2. Backlit 7 mm thick slice of tangiwai, showing browns, greys and a tinge of blue. Canterbury Museum ZM1409



Figure 3. A backlit view of the reverse of a tangiwai hei tiki (pendant in human form) showing high translucency and some flakiness. Canterbury Museum E161.68



Figure 4. A backlit view of a mere made from tangiwai showing shades of green, blue and brown. Canterbury Museum E141.185

In Aotearoa nephrite and bowenite are found only in the South Island at the localities shown in Figure 5. The best quality tangiwai is found in a narrow band of ultramafic rocks near Piopiotahi (Milford Sound) that runs south from Anita Bay (Fig. 6) to Poison Bay, but less transparent stone can also be found in Westland and Nelson (Beck et al. 2010: 38).

Piopiotahi, the Māori name for Milford Sound, is reported to be an ancient name. Ethnologist Herries Beattie was told that Piopiotahi received its name from a canoe that came from Hawaiki to get pounamu (Beattie 1945: 101, 143). “Mohi”, of Rakiura, told his people that Piopiotahi was named after a pet bird owned by Māui (Beattie 1945: 118). Both pieces of information give a hint of the antiquity of tangiwai recovery. It is important to note that several other *whare pūrākau* (schools of learning) have slightly different accounts of the origin of the *ingoa wāhi* (placename) Piopiotahi.¹

Tangiwai translates literally as tear water and two accounts of its origin were collected by Beattie. He was told that the three wives of Tama-ki-te-rangi (Captain of the Tairea canoe) deserted him and that he searched the West Coast of the South Island for them. At Piopiotahi he found one of his wives, but she had turned into pounamu. As Tama wept over her his tears penetrated the rock creating tangiwai – the tears of Tama-ke-te-rangi (Beattie 1920: 46).



Figure 5. Map showing sources of nephrite and tangiwai (bowenite) in Te Wai Pounamu (South Island), Aotearoa. Source: Te Ara The Encyclopedia based on Beck, Mason 2002: 26, <https://teara.govt.nz/en/map/7649/new-zealands-pounamu-deposits> [accessed 13 April 2022]

Herries Beattie was also told that Koko-tangiwai and her children left the Tairea canoe at Piopiotahi and were turned into the kinds of pounamu found at Anita Bay. Koko-tangiwai stayed near the sea while her children wandered further inland (Beattie 1945 :143–144).

Māori have specific names for each kind of nephrite (see Beck et al. 2010: 19–20) and the different appearances of tangiwai. Writing from Marton in 1904, Te Heuheu Tukino and five other kaumātua (elders) shared the names of four types of tangiwai. The first was koko tangiwai which resembled the feathers on the neck of a tūi, another was koko makurukuru which resembled the feathers on the tūi when it sang, tangiwai makuku was clear and semi-transparent while the fourth, tangiwai kawakawa inanga, looked like the leaf of a kawakawa tree but with white cloudy patches (Milford Sound Greenstone Company 1906: 4).

Initially Europeans described tangiwai as “noble serpentine” to distinguish it from “common Serpentine” (Hector and Skey 1866: 412). The term bowenite was introduced as a geological name for tangiwai in 1880 by Friedrich Berwerth who was analysing samples sent to Austrian geologist Ferdinand von Hochstetter (Grapes and Nolden 2021: 222).

Until the early 1900s most Pākehā (non-Māori New Zealanders) referred to both tangiwai and nephrite as greenstone. European use of the term tangiwai was



Figure 6. Detail from a 1903 Department of Tourist and Health Resorts map showing Anita Bay, near the entrance of Piopiotahi (Milford Sound). Canterbury Museum 2007.105.13

almost non-existent until it was popularised in the early 1900s by the Milford Sound Greenstone Company.

In New Zealand the term bowenite was first used to describe Anita Bay tangiwai by Patrick Marshall in 1904 (Marshall 1904: 482). Grapes and Nolden (2021: 224) have pointed out that while tangiwai and bowenite found elsewhere in the world share similar physical properties their modes of origin and appearance are completely different. They suggest that the more culturally appropriate petrographic name of tangiwaite should be used for the rare variety of antigorite serpentine found in New Zealand.

In southern Aotearoa, where the stone is found, it is takiwai but for the purpose of consistency, I have used the term tangiwai.

Māori Recovery and Use

It is apparent from the artefacts and raw stone found throughout Aotearoa that the recovery and use of tangiwai is of long standing. Tangiwai has been found in early sites at Heaphy River, Wairau Bar and Papatowai (Coultts 1971: 62). Canterbury Museum also holds raw tangiwai found in historic contexts at Redcliffs (Fig. 7) and Moeraki (Fig. 8) giving some indication of the journeys of tangiwai.

The original name for what is now known as Anita Bay appears to have been lost but it has been called Hupokeka



Figure 7. Water worn tangiwai found at Redcliffs Flat, near Moa Bone Point Cave during excavations in 1957. Canterbury Museum E158.435

since a chief of that name and his whānau (family) were shot there by sealers in 1824.² Having had a fight with Māori further north, sealers came to Anita Bay and Hupokeka, not knowing of events further north, was standing on a rock to welcome them when he was shot. The sealers killed everyone at the kāinga (village) and put the bodies in a canoe which they set alight and pushed out to sea (Beattie 1945: 110).

Ethnologist Herries Beattie recorded the following names relating to Anita Bay (1949: 43-44). The landing place is Te Tauraka-o-hupokeka (the anchorage of Hupokeka). The hills immediately behind the bay were named Kokotakiwai after a celebrated woman who left the Tairea canoe there. The cliff where tangiwai was found was known as Te Horo (the landslip). Greenstone Creek was called Awatikiwai and the whole locality was known as Te Wahi-tikiwai (the place of takiwai or tangiwai). Mariner Tohi Te Marama (c.1829-1918) told James Cowan about the old kāinga “on the gentle slopes above the seaward side of Anita Bay” and in 1906 the difference in vegetation could still be seen (*Lyttelton Times*, 26 April 1913: 8).

The recovery of tangiwai involved long journeys which meant that it was always relatively scarce. This together with its beauty meant that it was highly valued. Kaumātua at Makaawhio in South Westland recalled that “a small piece of tangiwai was worth a large piece of pounamu”.³

Māori made exquisite taonga (treasures) from tangiwai as can be seen in the catalogue accompanying this article and in other museum collections. A particularly magnificent



Figure 8. A fragment of tangiwai found at Moeraki, Otago, date unknown but prior to 1944. Canterbury Museum E144.121.1

tangiwai hei tiki (Fig. 9) cared for by Canterbury Museum is believed to have been crafted during the 1840s or 1850s. Many taonga are much older than this. A perusal of on-line catalogues indicates that the most common items to be made were neck and ear pendants which tend to be long and thin, maximising the transparency of the stone. Collections also include pekapeka (a representation of the native bat), kaka poria (legs rings to hold captive kaka) and fish lure shanks.

Māori from southern New Zealand continued to regularly collect tangiwai for many years, both by sea and overland. A route from Piopiotahi to Lake Te Anau over Omanui (now known as Mackinnon Pass on the Milford Track) was used to transport stone. From Te Anau the stone was taken down the Waiau River on mōkihi (canoe made from bullrushes and flax) to the southern coast (*Otago Witness*, 11 July 1857: 4; Beattie 1949: 62-63). In about 1838 there was an accident in which three women handling one of a flotilla of heavily laden mōkihi drowned along with their infants and after this tragedy the route was not used (*Otago Witness*, 4 March 1903: 12).

In 1897 kaumātua at Makaawhio in South Westland remembered that they went in waka (timber canoe) from Maitahi (Bruce Bay) to Piopiotahi for tangiwai, about once every 20 or 30 years and that Ngāti Waewae from further north also went to collect tangiwai (Skinner 1912: 145). They further remembered that two double canoes went from Piopiotahi to Waimate and another two went to Kaiapoi, all loaded with tangiwai (Skinner 1912: 146). Tohi Te Marama recalled long cruises around the sounds



Figure 9. Tangiwai hei tiki. Canterbury Museum E177.275

during the 1870s for fur seals but also to collect tangiwai (*Evening Post*, 15 March 1930: 9). In 1904 “Miner” who had been at Piopiotahi in 1876 remembered that Māori from Maitahi arrived in two open boats and collected tangiwai, taking away about 70 kg (*Otago Witness*, 16 November 1904: 4).

Hori Kerei Taiaroa (1830s–1905) argued for many years that the Government should honour a promise made to his father, that if he signed the 1853 deed of cession of Murihiku, 100 acres of land at Anita Bay would be reserved for his whānau (extended family) so that tangiwai could be collected.⁴ Taiaroa’s claim was discussed in parliament several times but was unfortunately not resolved before William Bertram obtained a mining lease from the Government in 1903 (Evison 1993: 495).⁵

Within Ngāi Tahu, many oral and whānau histories along with unpublished material are important sources of further information about longstanding customary recovery and use of tangiwai.⁶ Ownership and management of tangiwai was returned to Ngāi Tahu in the 1997 Ngai Tahu (Pounamu Vesting) Act which returned the rights and control of all pounamu to the iwi (tribe).

Māori-Pākehā Exploitation

The author has previously detailed the collection of tangiwai and later nephrite from South Westland during the 1840s (Bradshaw 2021). This speculation was funded by merchants based in Sydney and facilitated by locally

based Pākehā mariner Captain William Anglem and his wife Maria Te Anau. In 1842 perhaps four tons of tangiwai from Hupokeka was collected for the Chinese market. The vessel used to transport the stone was the clipper schooner *Anita* and this gave rise to the English name for the bay where tangiwai was obtained (Bradshaw 2021: 183). There is no information about what happened to this shipment of tangiwai other than that it was sold in China. It is believed that this is the first large-scale export of unworked pounamu from Aotearoa and it is probably the first sizeable export by Europeans of any New Zealand mineral.

Several sources give hints of another retrieval of tangiwai, this time by Captain John Howell who was based at Riverton. Howell had married Kohi Kohi in the mid-1830s and was familiar with Piopiotahi, reporting that he first saw the self-introduced bird tauhou (silver eye) there in 1832 (*Otago Witness*, 13 September 1916: 53). His descendants recall that he collected a shipment of “greenstone” from there (Wilson 1976: 5, 10). This probably occurred in 1865 when Howell had a short-lived whaling station at Anita Bay (*Nelson Examiner*, 13 July 1865: 3). If the shipment did occur there is no evidence about where it went, but it is possible that it went to Dunedin where lapidarists were in business by the 1860s (Conly 1948: 57).

Pākehā Interest

European visits to Piopiotahi gradually increased. In 1863, geologist Dr James Hector was the first to officially note Anita Bay as a source of tangiwai. Hector didn’t differentiate it from nephrite, commenting that this was the beach from which Māori sourced “the jade or greenstone for the manufacture of their ornaments and weapons” (*Otago Daily Times*, 11 November 1863: 9). The tangiwai collected by Hector was exhibited at the University of Otago as “noble serpentine” during the 1865 New Zealand Exhibition and included water worn boulders and smaller “very attractive” pieces that had been cut and polished (Hector and Skey 1866: 412).

As visits by Pākehā increased so did the amount of fossicking. Recorded occurrences indicate that collecting was enthusiastic. When the schooner *Fawn* called at Anita Bay in December 1863 about 27 kg of tangiwai was collected by those on board, some of which was sold at Lyttelton (*Otago Daily Times*, 1 April 1864: 5).

In May 1867, an official visit to South Westland by a group which included Dr Hector, brought back several “large and beautiful specimens” of “greenstone” from Milford Sound (*Waikato Independent*, 11 May 1867: 4). In the same year passengers on an expedition to Martins Bay made an “eager rush onshore” to collect specimens (*Otago Daily Times*, 26 December 1867: 4).



Figure 10. A waterworn tangiwai pebble, typical of those picked up on the beach at Anita Bay. Canterbury Museum E166.515

For some, their first foot on New Zealand shores was at Anita Bay. In February 1874 passengers on board the *Alhambra* which was sailing from Melbourne to Dunedin called at Piopiotahi where passengers spent an hour or so picking up tangiwai pebbles (Fig. 10) and returned on board “loaded with specimens” (*Otago Witness*, 21 February 1874: 12).

Just a month later the *Luna* visited, with many on board going ashore specifically to find tangiwai, some equipped with hammers. Slabs and lumps were broken off larger rocks and a good number of pebbles were collected. Geologist Captain Frederick Wollaston Hutton, who was on board, disappointed many by pronouncing that the stone was serpentine and “not the greenstone of the Maori” (*New Zealand Mail*, 28 March 1874: 8). Later Hutton and Ulrich (1875: 28) would refer to tangiwai as “inferior greenstone” further damaging its reputation.

Collecting specimens or mementoes continued for many years. The photograph in Figure 11 showing tourists returning from Anita Bay to their ship in the early 1900s has the following written on the back “Returning from Greenstone Gully with many nice trophies”.



Figure 11. Tourists returning to their ship from the beach at Anita Bay with their pockets full of tangiwai. National Library PAColl-10563-081-51

European Mining

After the discovery of gold in Otago and on the West Coast during the 1860s, prospectors scoured the countryside looking for gold or other minerals. Some of the hardier ones searched in Fiordland. One of these was Donald Sutherland who, in 1880, reported that he and his mate McKay (sometimes MacKay) had found “a solid reef of greenstone” near Milford Sound (*Otago Witness*, 17 July 1880: 21).

Along with tangiwai, Sutherland and McKay also sent copper and asbestos to Dunedin for testing, and it was the asbestos that a mining lease was granted for at Anita Bay in January 1882 (*Oamaru Mail*, 16 Feb 1882: 2). Artist Samuel Moreton who was frequently at Piopiotahi later recalled that a fair amount of tangiwai and asbestos was recovered but that the venture foundered when Sutherland would not let his partners use his boat without paying.⁷

The reef of tangiwai was later covered by a landslide (*Otago Daily Times*, 26 February 1889: 3). Amazingly, in this seldom visited part of the country, the landslide was heard by gentleman farmer Robert Paulin who, in 1886, was on a prospecting trip on the cutter *Rosa*. After two days of heavy rain those on board the *Rosa*, anchored at Anita Bay, were startled by “a tremendous report” followed by a sound like heavy thunder which lasted for about 10 seconds. At daylight they found that an enormous slip more than three kilometres wide had covered much of the land behind Anita Bay (Paulin 1889: 105).



Figure 12. John William Alexander Bertram (1875–1919).
Courtesy of Geoff Bertram

The instigator of the next Pākehā extraction of tangiwai was Foxton-born John William Alexander Bertram (Fig. 12) who had married in Dannevirke in 1899 just before moving to the mining district of Kyeburn near Naseby in Otago. Here he worked as a miner and at some point, became acquainted with long-time Fiordland prospector and Sutherland’s old mate John McKay.

In April 1903 Bertram applied for a 3-year licence to prospect for “greenstone” over 200 acres of land at Anita Bay and this was granted for the rental of 20 shillings per year (*Mount Ida Chronicle*, 24 April 1903: 3). Soon afterwards Bertram and McKay went to Milford Sound to find tangiwai. Bertram says he was guided by Māori tradition (Milford Sound Greenstone Company 1906: 2)

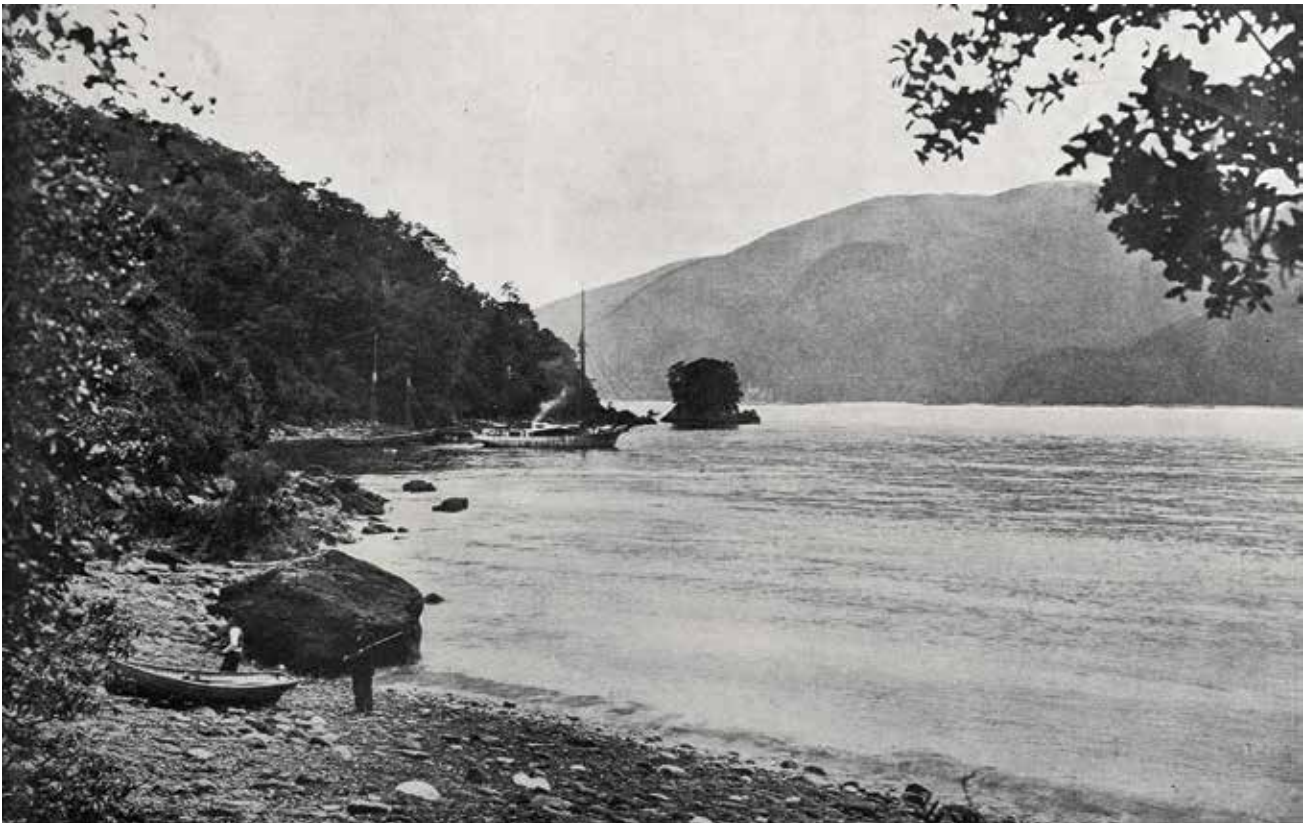


Figure 13. A photo of Anita Bay taken in March 1904 by Guy Morris. The schooner *Emma Sims* in on the right, anchored near the Milford Sound Greenstone Company’s schooner *Belle*. *Auckland Weekly News*. Auckland City Library AWNS-19071024-1-2

but it is much more likely that McKay, who had previously been at Anita Bay with Sutherland, knew where to look.

Having located the reef, Bertram returned to Dunedin to raise funds and create the Milford Sound Greenstone Company. By September 1903 he was back at Anita Bay with a group of experienced miners and 5 months' provisions (*Otago Daily Times*, 8 September 1903: 6). Many months were spent at the mine and at least one tunnel was driven into the reef. In May 1904 nearly two tons of tangiwai of "remarkable quality" was taken to Dunedin (*Otago Daily Times*, 24 May 1904: 3). The stone was described as "jointy" with the pieces varying in size from one kg to 50 kg (*Otago Daily Times*, 25 May 1904: 8).

While he was at the mine Bertram had been visited by University of Otago geologist Dr Patrick Marshall who was travelling on the schooner *Emma Sims* (Fig. 13) (*Otago Daily Times*, 22 February 1904: 4). Marshall visited the work site and collected specimens (*Otago Daily Times*, 18 March 1904: 7; *Evening Star*, 15 Sept 1904: 7) one of which he later donated to Canterbury Museum (Fig. 14). Marshall must have been impressed because he gave a favourable professional opinion on the "unequalled quality" of the stone (Milford Sound Greenstone Company 1906: 8) and, in 1907, purchased shares in the company.⁸

On his return to Dunedin, Bertram talked up the "extensive reef of greenstone" and said there was a market for it in Great Britain, Europe and America (*Auckland*

Star, 6 May 1904: 4). He said that stone could be mined and delivered to Dunedin at a cost of just half a pound per kilogramme of stone (*Otago Daily Times*, 24 May 1904: 3) but when dressed and cut for jewellery its value was from £20 to £80 per kilogram wholesale (*Otago Witness*, 27 April 1904: 28). Bertram was certainly making the venture sound attractive to investors.

A letter writer, "West Coaster", was incredulous and asked whether the stone from Piopiotahi was even greenstone, pointing out that samples from Anita Bay were obviously different from "true greenstone". "West Coaster" also said that prices offered for greenstone to Greymouth dealers by Dunedin and Auckland buyers was from a shilling to £1 per kilogram and that there was very little demand for it (*Otago Witness*, 22 June 1904: 26).

In rebuttal, Arthur A Adams, accountant for the Milford Sound Greenstone Company and a minor shareholder, invited anyone who thought "ordinary greenstone" was the only proper greenstone to view the quality of the stone which, he said, was "of much greater value than the West Coast or pounamu stone" (*Otago Daily Times*, 23 June 1904: 9).

The company was keen to differentiate their product from nephrite or "true greenstone" and began using the word tangiwai which they described as the "Queen of Greenstones" (Milford Sound Greenstone Company 1906: 1). Bertram went to Anita Bay again in June 1907 and returned to Dunedin with another load of stone,



Figure 14. A block of tangiwai collected from Anita Bay by Patrick Marshall in 1904. Canterbury Museum ZM832

this time leaving no-one at the mine.⁹ In April 1908 the mine was described as abandoned (*Southern Cross*, 11 April 1908: 2) and the company went into liquidation in December 1908.¹⁰

By late 1910 the mining lease at Anita Bay had been transferred to a new company, the Auckland-based Milford Sound Tangiwai Company (*Southland Times*, 16 January 1911: 4). Bertram continued his association with tangiwai and in February 1911 sailed with a party of miners to Anita Bay for the new company (*Otago Daily Times*, 24 February 1911: 8). The trip was reported as very successful with the quantity retrieved “exceeding expectations”. Oddly though, in a locality that is rarely affected by it, work on the lease was being suspended for the winter due to snow (*New Zealand Herald*, 26 May 1911: 6). By the following winter the company was in liquidation (*The Dominion*, 29 July 1912: 1).

The Milford Sound Greenstone Company reported retrieving two tons and then another load presumably of a similar size and even the short-lived Auckland-based company had four tons of rough stone and finished goods worth over £800 when they went into liquidation (*The Dominion*, 29 July 1912: 1). Altogether at least eight tons of tangiwai was recovered from Anita Bay from 1904 to 1911. There is some mystery about what happened to it all.

Tangiwai Treasures

Before the recovery of tons of tangiwai from Piopiotahi in the early 1900s only relatively small quantities had been available but it is evident that some did find its way to lapidarists and jewellers. For example, Christchurch jewellers M Sandstein & Son were advertising products made from tangiwai for three months during 1902 (*Lyttelton Times*, 19 Feb 1902: 7 – 28 May 1902: 9).

But tangiwai was difficult to work, especially if you expected to carve it like nephrite. According to Master Carver Fayne Robinson, tangiwai is easy to work with soft tools but shatters under the pressure of modern tools.¹¹ Letter writer “Miner” described tangiwai as “worthless” and said that lapidaries in Dunedin slung it out in the back yard because they “could not work it into anything” (*Otago Witness*, 16 November 1904: 4).

The fact that Māori had a very high regard for tangiwai was recognised by the Milford Sound Greenstone Company who saw Māori as important customers (*New Zealand Herald*, 16 January 1909: 10). It is likely that the company’s focus was on simple pieces that were similar in style to traditional neck and ear pendants. The pendants may have been shaped and polished locally or in Europe (as was common for nephrite) and sent back to New Zealand where local jewellers added their own gold embellishments as in Figure 15. No advertisements have been found on Papers Past for tangiwai products but Fritz Larsen of Auckland, who was said to have the largest

lapidary works in New Zealand, had 100 “eardrops” stolen in 1911, many of which were made from tangiwai (*Poverty Bay Herald*, 26 April 1911: 5; *Taranaki Herald*, 10 June 1914: 2).

In 1906, the Milford Sound Greenstone Company was reported to have seven men employed working greenstone in their Dunedin workshop (*Wairarapa Daily Times*, 9 April 1906: 5). The men may have been making hei tiki as in the same year Augustus Hamilton, Director of the Dominion Museum, wrote that the “large number of hei tikis” available at the time were “nearly all made from the newly opened Tangiwai deposits at Milford sound” (Hamilton, 30 August 1906, quoted by Austin 2019: 52).

It is possible that some tangiwai was sent to England. In an undated letter written in about 1906, John Grey Taiaroa, continuing with his father’s battle to have the family’s claim to Anita Bay recognised, said that “the Government has acquired Piopiotahi and have allowed it [tangiwai] to be bodily removed to London where pieces can be bought at ‘retail price’ equal to £300 per square yard, unimproved value”.¹² From about 1904 there was a craze in England for small pounamu hei tiki and some of these could have been made from tangiwai (*Illustrated London News*, 30 July 1904: 168).

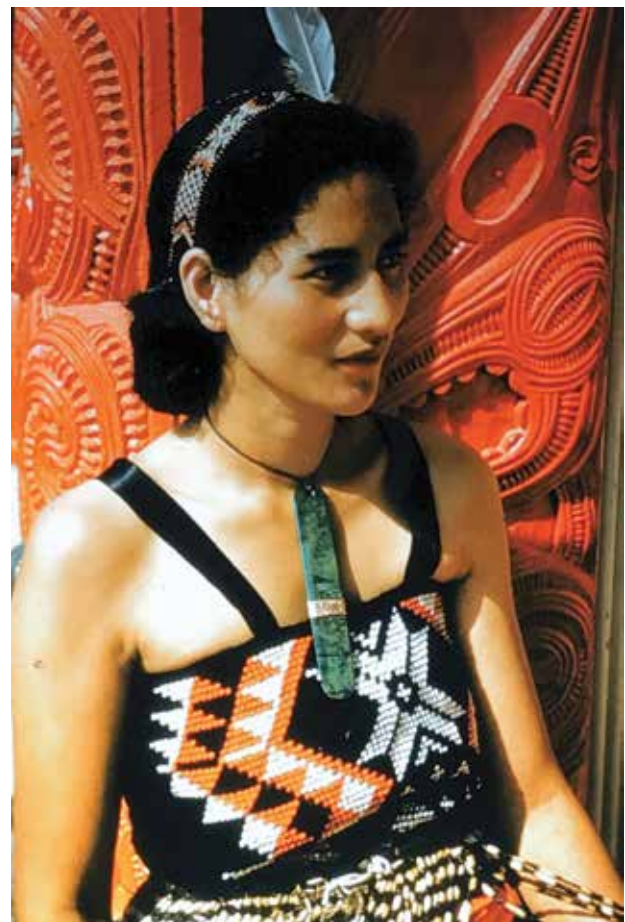


Figure 15. A photograph taken by Neville Hatwell in the 1960s of a young woman wearing a spatulate shaped tangiwai pendant with an engraved gold band. Courtesy of Steve Mahuika

A few mentions of items made with tangiwai appear in New Zealand newspapers. These include a pendant of “transparent greenstone” and pearls (*Otago Witness*, 29 April 1908: 73), a tangiwai and gold brooch (*Evening Post*, 30 December 1909: 1) and a tangiwai hei tiki (*Auckland Star*, 14 June 1916: 2). Tangiwai pendants seem to have been referred to simply as “a tangiwai”. Mrs Jennings, headmistress of the Native School at Ōtaki, was presented with a greenstone brooch and “a tangiwai” 125 mm long and of excellent quality (*Manawatu Standard*, 2 October 1909: 5). Visiting Australian tennis players were each given a tangiwai pendant as a memento of their visit (*New Zealand Herald*, 20 January 1912: 9) as was Captain Halsey of the HMS *New Zealand* (*Rangitikei Advocate and Manawatu Argus*, 22 April 1913: 4).

Tangiwai Taonga at Canterbury Museum

Peter Coutts, who undertook archaeological work at Anita Bay, observed that tangiwai is rare in museum collections in comparison to other materials (Coutts 1971: 62) and this is certainly the case at Canterbury Museum. Canterbury Museum cares for more than 2,500 worked pounamu taonga but only 33 of these are tangiwai. Illustrations of Canterbury Museum’s modest collection of tangiwai taonga are provided in a brief catalogue which follows this article.

Previously some taonga had simply been identified as greenstone in catalogue records and not all tangiwai had been correctly identified. Mineralogists can quickly tell the difference between tangiwai and nephrite because tangiwai can be scratched by a knife whereas nephrite cannot. Obviously, this is not an option for museums. Fortunately, the transparency and colours of tangiwai make it possible to identify taonga reasonably securely although it is sometimes necessary to hold the taonga to gauge its weight and feel, which is a much more subtle process.

More complicated has been establishing when a taonga might have been made. European lapidaries using tangiwai appealed to Māori customers by mimicking traditional designs. In addition, because tangiwai is easier to drill than nephrite it is harder to distinguish with certainty between drill holes made using traditional methods as opposed to those made with metal tools.

Even though at least some of the tangiwai recovered during the early 1900s was made into contemporary jewellery, such as pendants and brooches, no examples of these are held within Canterbury Museum’s small collection of pounamu jewellery. It may be that holders of both traditional taonga and those made more recently value them so highly that they are passed down through families rather than finding their way to museums or auction houses.

Summary

Tangiwai is a special and rare mineral with a distinct beauty that has been valued since the settlement of Aotearoa New Zealand. The source of high quality tangiwai is in a remote and physically challenging location yet it is found in some of the country’s oldest archaeological sites.

Not as tough as nephrite, but with its own special beauty, tangiwai was mostly made into items of personal adornment.

Tangiwai was recognised as a commodity by newly resident Pākehā mariners and their Māori families and this resulted in a shipment of stone being sent to China in 1843 and another shipment being collected in 1865, which may have gone to Dunedin.

Europeans also recognised the beauty of tangiwai and collected it enthusiastically from at least the 1860s. Specific mining by Pākehā occurred in the early 1880s and from 1904 to 1911 and it is estimated that at least eight tons of tangiwai was collected during this time. There are unanswered questions about where it went and what it was made into, but indications are that at least some of it was made into hei tiki and pendants.

Tangiwai deserves to be more widely recognised in museum collections as a unique and special taonga. It has never been common and as well as being valued for its beauty and rarity, its retrieval also tells the story of courage and stamina, of trading networks and in the case of Hupokeka and his people, of murder. Tangiwai, the stone of tears.

Acknowledgements

For advice and suggestions, I would like to thank Dougal Austin, Paul Madgwick, Rodney Grapes and Muriel Johnstone. I am also grateful to Fayne Robinson and Riki Manuel for providing their expertise on the tangiwai taonga at Canterbury Museum and to the Trustees of the Taiaroa Collection. The photography work by Chris Hoopman is very much appreciated.

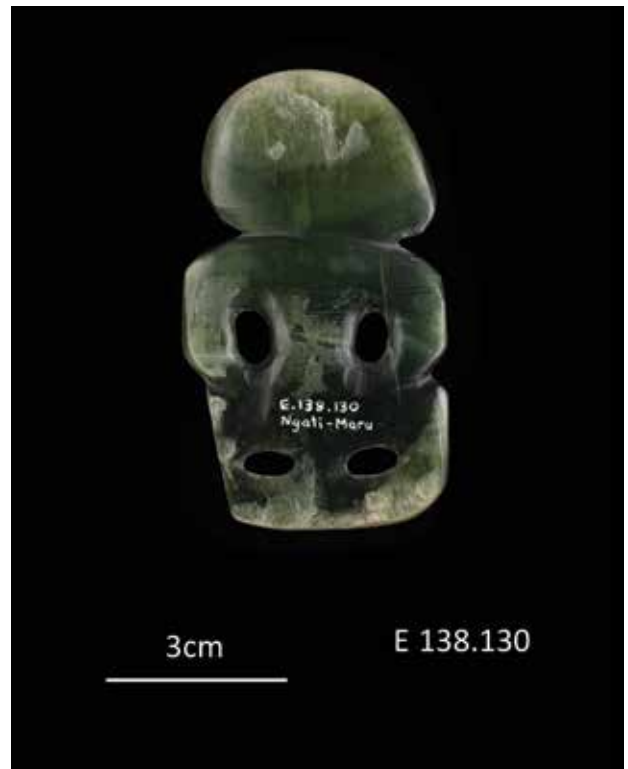
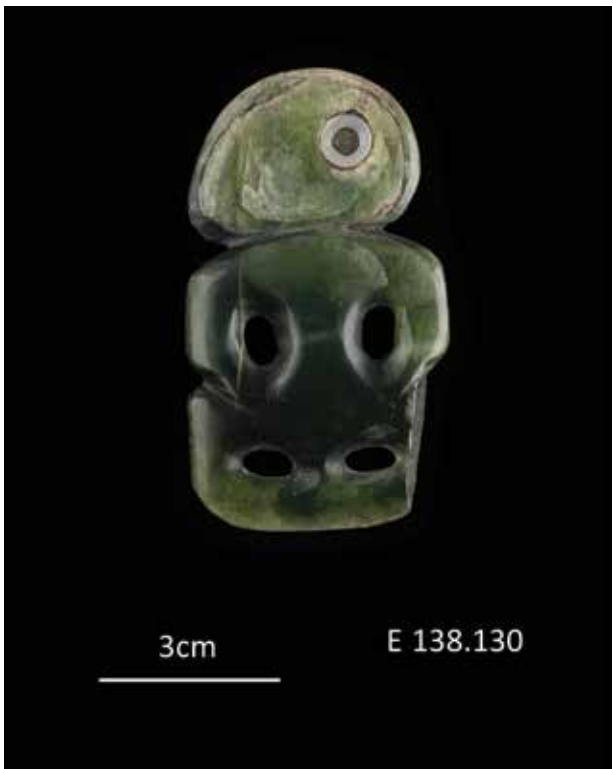
Endnotes

- 1 Muriel Johnstone of Murihiku Pounamu Management Committee, personal communication, 21 May 2022.
- 2 Information from a hand-drawn map titled *Part of the West Coast of the Middle Island* in Admiral John Lort Stokes papers at Royal Museums Greenwich, reference STK/74/2.
- 3 Nomenclature, legends etc as supplied by Māori in South Westland, compiled by W Wilson, in Anderson, Johannes Carl Papers, MS-Papers-0148, p86. Alexander Turnbull Library, Wellington.
- 4 HK Taiaroa to Native Minister 15 October 1896, Canterbury Museum, 6/46, Box 24, folder 158, item 210.
- 5 The Taiaroa whānau was eventually awarded £53 several years after Taiaroa's death.
- 6 Muriel Johnstone of Murihiku Pounamu Management Committee, personal communication, 21 May 2022.
- 7 Samuel H Moreton to Wynand Boers, 6 February 1915, in Moreton, Samuel H: Correspondence between Samuel H Moreton (artist) and W Boers concerning Hector's expedition, Otago, MS-1386, Alexander Turnbull Library, Wellington.
- 8 List of shareholders of Milford Sound Greenstone Company, dated 14 June 1907 in The Milford Sound Greenstone Company Limited 1906–1912, Archives New Zealand, Dunedin, R977127.
- 9 Inspector of Mines, 10 June 1907 in Greenstone Mine Naita Bay (sic) R23533941), Archives NZ, Dunedin.
- 10 25 November 1908. Milford Sound Greenstone Company file, Archives NZ Dunedin. R977127.
- 11 Personal communication with author, 12 April 2022.
- 12 Undated letter written c.1906 by J G Taiaroa, Canterbury Museum, 6/46, Box23, folder 149, item 11.

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Catalogue



Hei tiki (pendant in human form) Taranaki
H: 175mm. W: 42mm. D: 5mm
Canterbury Museum E138.130

Hei tiki shows flaking and fracturing, including the loss of part of the legs. Found in the Museum collection during a 1938 inventory



Hei tiki (pendant in human form) location unknown
H: 61mm. W: 41mm. D: 6mm.
Canterbury Museum 1948.70.6
Manufactured using metal tools prior to 1948



Hei tiki (pendant in human form) location unknown
H: 64mm. W: 40mm. D: 7mm.
Canterbury Museum E161.68
Crudely made using metal tools. Purchased in an antiques shop near Oxford, England before 1961



Hei tiki (pendant in human form) Little River, Banks Peninsula
H: 53mm. W: 26mm. D: 3mm.
Canterbury Museum E179.5
Found in 1934. A fracture has led to the pendant splitting



3cm

E177.275

Hei tiki (pendant in human form) location unknown (front)

H: 116mm. W: 63. D: 20mm.

Canterbury Museum E177.275

Thought to have been made by Māori during the contact period, possibly 1840–1850



Hei tiki (pendant in human form) location unknown (back)

H: 116mm. W: 63. D: 20mm.

Canterbury Museum E177.275

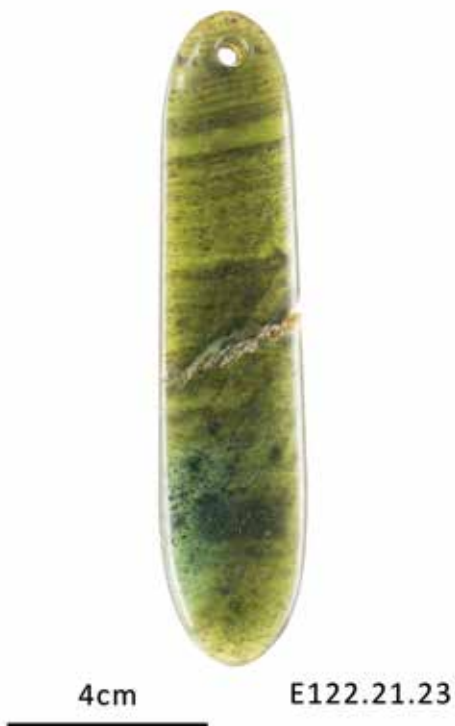
Thought to have been made by Māori during the contact period, possibly 1840–1850



Kuru (pendant) location unknown
H 96mm W 16mm D 9mm
Canterbury Museum E192.11



Kuru (pendant) location unknown
H: 76mm. W: 13mm. D: 5mm.
Canterbury Museum E192.10



Kuru (pendant) Whakamoia Bay, Banks Peninsula
H: 130mm. W: 30mm. D: 5mm.
Canterbury Museum E122.21.23
Found before 1922. Broken and glued before arrival at Museum



Kuru (pendant) location unknown
H: 159mm. W: 38mm. D: 5mm.
Canterbury Museum E153.402
Collected by Thomas Cornelius Prichard of Spring Creek,
Blenheim



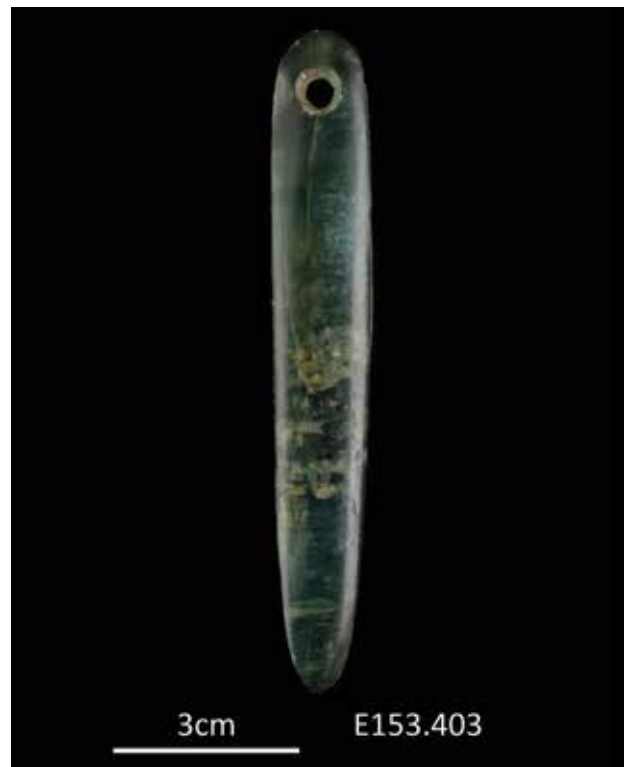
Kuru (pendant) Houhoupounamu, Canterbury
H: 84mm. W: 13mm. D: 4mm.
Canterbury Museum E138.1136
Found before 1938. Very small drill hole



Kuru (pendant) Tuahiwi, Canterbury
H: 47mm. W: 4mm. D: 3mm.
Canterbury Museum 1952.30.1287
Found in 1894



Kuru (pendant) Eastern Bays, Banks Peninsula
H: 78mm. W: 12mm. D: 5mm.
Canterbury Museum E149.594



Kuru (pendant) location unknown
H: 107mm. W: 16mm. D: 3mm.
Canterbury Museum E153.403
Collected by Thomas Cornelius Prichard of Spring Creek,
Blenheim



Kuru (pendant) location unknown
H: 73mm. W: 16mm. D: 4mm.
Canterbury Museum E167.356
Suspension hole has broken open



Kuru (pendant) location unknown
H: 81mm. W: 12mm. D: 7mm.
Canterbury Museum E167.357
Possibly made with metal tools



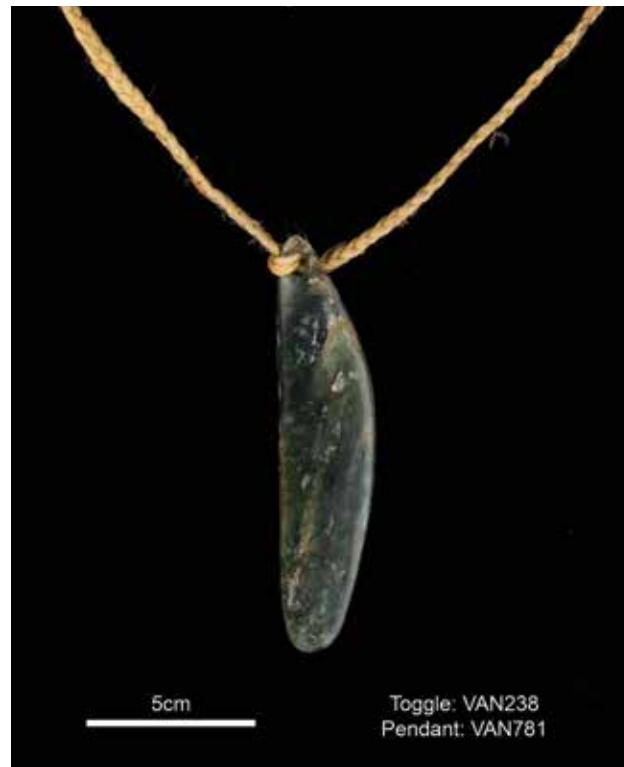
Kuru (pendant) Edgecombe south of Clarence River,
Marlborough
H: 61mm. w: 13mm. D: 5mm.
Canterbury Museum 1939.38.17



Kuru (pendant) location unknown
H: 80mm. W: 18mm. D: 12mm.
Canterbury Museum E139.62
Collected by Selwyn Bruce



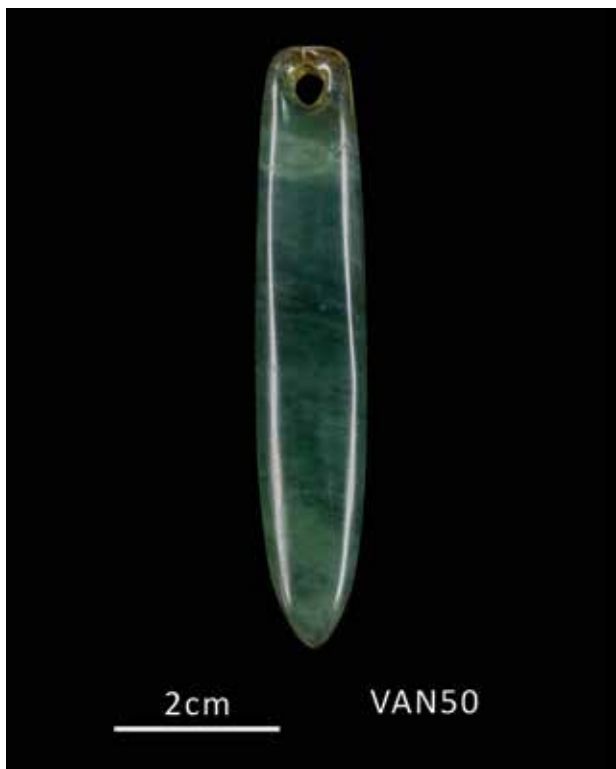
Kuru (pendant), part of, location unknown
H: 111mm. W: 15mm. D: 12mm.
Canterbury Museum E166.667
From the estate of Rev William Baumber (1852–1932).
Fractured through the middle and broken across the top. The
marks from the process of grinding and snapping to make it are
still apparent



Kuru (pendant) Goughs Bay, Banks Peninsula
H: 124mm. W: 27mm. D: 4mm.
Louis Vangioni Collection, Canterbury Museum 1952.30.521
Found in 1937 without cord



Kuru (pendant) location unknown
H: 147mm. W: 14mm. D: 12mm.
Canterbury Museum E150.526
A gift to Anglican Missionary James Stack (1835–1919) a resident of Tuahiwi, Canterbury



Kuru (pendant) Flea Bay, Banks Peninsula
H: 72mm. W: 13mm. D: 11mm.
Louis Vangioni Collection, Canterbury Museum 1952.30.654
Found in 1896



Kuru (pendant) location unknown
H: 56mm. W: 20mm. D: 18mm.
Canterbury Museum 2002.7.4



Kuru (pendant) Tumbledown Bay, Banks Peninsula
H: 48mm. W: 15mm. D: 10mm.
Louis Vangioni Collection, Canterbury Museum 1952.30.656
Found in 1897



Kuru (pendant) location unknown
H: 81mm. W: 15mm. D: 9mm.
Canterbury Museum AR2000.31
Found in collection in 2000



Kuru (pendant) Little River, Banks Peninsula
H: 105mm. W: 15mm. D: 7mm.
Canterbury Museum E177.251



Kapeu (ear pendant) location unknown
H: 115mm. W: 10mm. D: 5mm.
Canterbury Museum 1939.53.2



Hei tiki (pendant in human form) location unknown
H: 30mm. W: 16mm. D: 5mm.
Canterbury Museum E183.155
Crudely made with the drill hole in part of the mouth, described
as being of recent manufacture when it was donated in 1983



Unfinished kuru (pendant) Wairau Bar
H: 90mm. W: 25mm. D: 10mm.
Canterbury Museum E163.514



Lure shank Wairau Bar
H: 62mm. W: 12mm. D: 8mm.
Canterbury Museum E199.160
Very neat hole, low polish



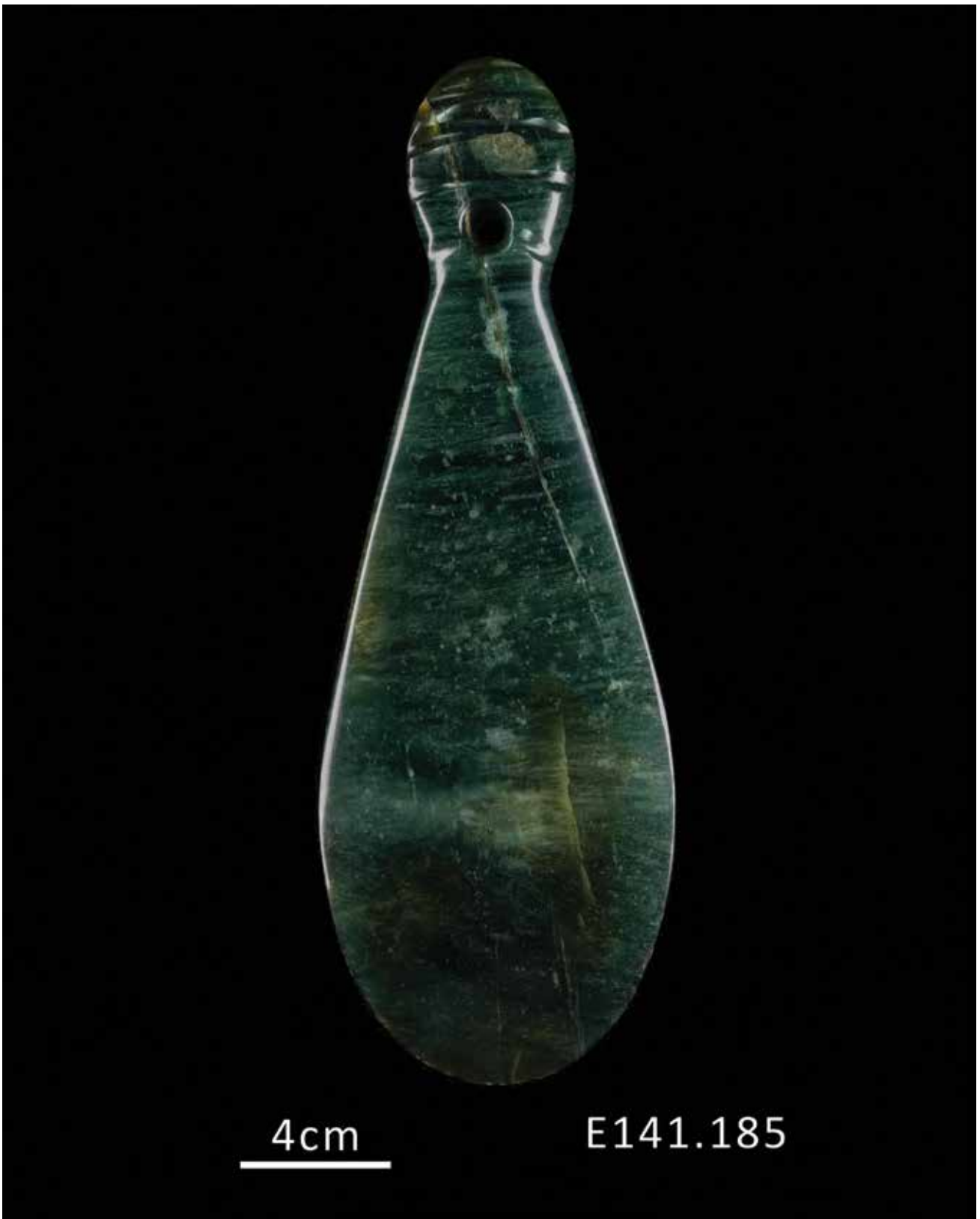
Pōria kākā location unknown
H: 28mm. W: 25mm. D: 1mm.
Canterbury Museum E138.474
Leg ring for captive kaka showing signs of flaking. Found in the
Museum collection during a 1938 inventory



Kuru (pendant) Tikao Bay
H: 34mm. W: 10mm. D: 2mm.
Louis Vangioni Collection, Canterbury Museum 1952.30.664
Found in 1925



Broken point Fishermans Bay, Banks Peninsula
H: 40mm. W: 5mm. D: 2mm
Canterbury Museum E149.491



Mere tangiwai location unknown

H: 270mm. W: 96mm. D: 18mm.

Canterbury Museum E141.85

Expertly made to maximise the beauty of the stone, it has a beautiful edge

Hugh Simms McCully and the Pits in Temuka Domain

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Two large, pre-European pits existed in Temuka Domain until they were destroyed in 1931. A relict landscape feature suggests one pit was about 50 by 25 metres. The second pit was smaller. Their presence in the domain was documented by John Hardcastle (1927: 7), an anonymous newspaper correspondent (1928), David Teviotdale (1931; 1932: 92) and Hugh McCully (1943a: 6). Hardcastle (1847–1927) and Teviotdale (1870–1958), accompanied by McCully (1878–1967), visited the pits in 1927 and 1931 respectively. The destruction of the pits was described in numerous articles in the *Temuka Leader* in 1931 and in this article the authors summarise that process. In 1926, Hugh McCully concluded the pits were associated with kūmara cultivation in the domain. His two granddaughters present a personal account of his observations about the pits and describe how he formed that view. What cultural activity actually produced the pits remains unconfirmed. Given the recent discovery of storage pits at Pūrākaunui, Hugh McCully's interpretation of the Temuka pits may yet be feasible.

Keywords: Hugh McCully, kūmara cultivation, pits, Temuka

Location of the Pits

Temuka township (44°25'S) is 18 km north of Timaru and 145 km south of Christchurch on State Highway 1. The township is adjacent to the confluence of the Temuka and Ōpihi rivers (Fig. 1) and is about 7 km from the east coast of South Canterbury. The 75 hectare Temuka Domain, which lies on the north bank of the

Temuka River, is owned by the Timaru District Council and is situated between the abandoned Te Wai-a-te-Rūati Pā on Orakipaoa Creek and Arowhenua Marae. 'Temuka' is a contraction of Te Umu Kaha (the strong oven) and references the numerous ovens found in the district (Davis and Dollimore 1966).

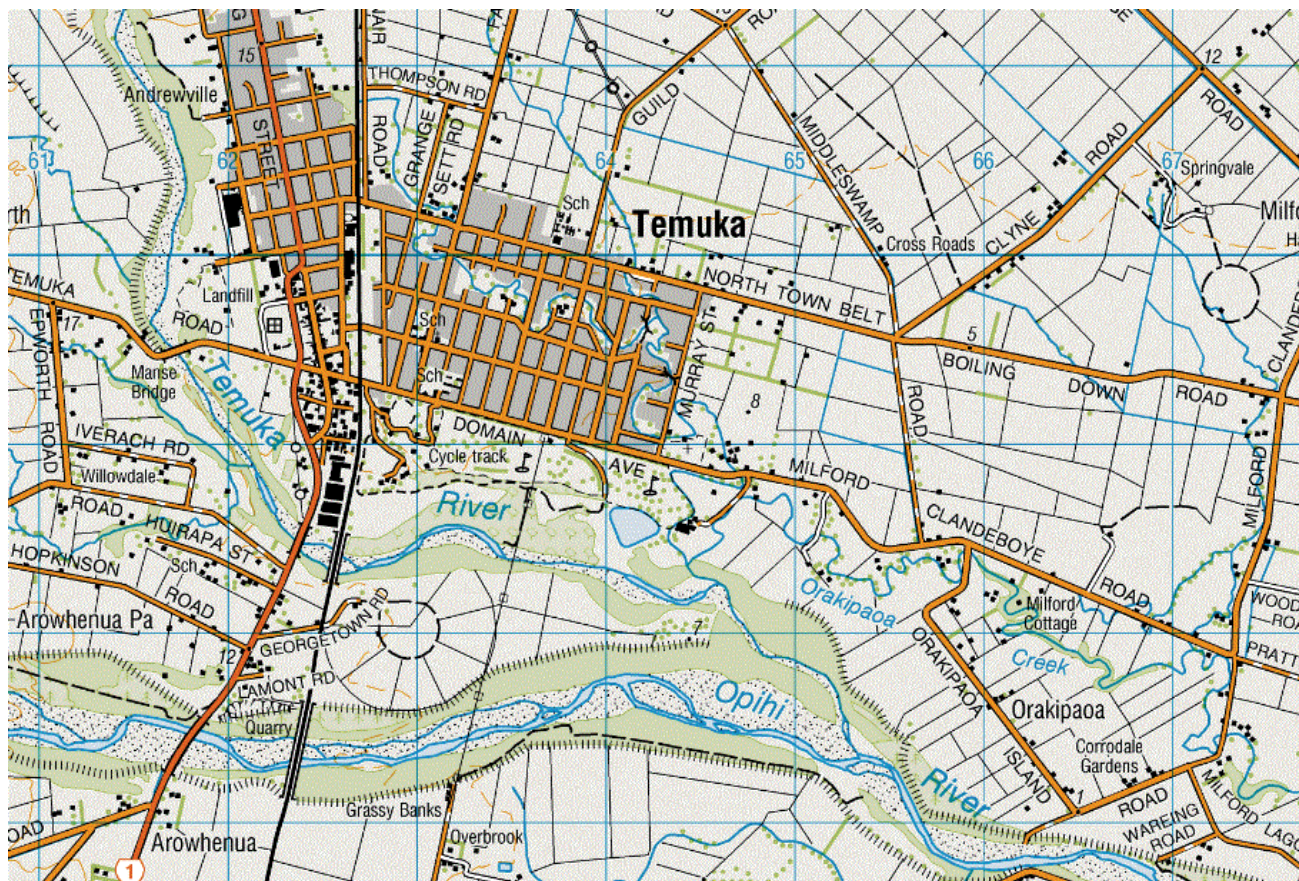


Figure 1. Location of Temuka Domain near the confluence of the Temuka and Ōpihi rivers. (This work is based on/includes Toitū Te Whenua Land Information New Zealand data which are licensed by Toitū Te Whenua Land Information New Zealand for use under the Creative Commons Attribution 4.0 International Licence)

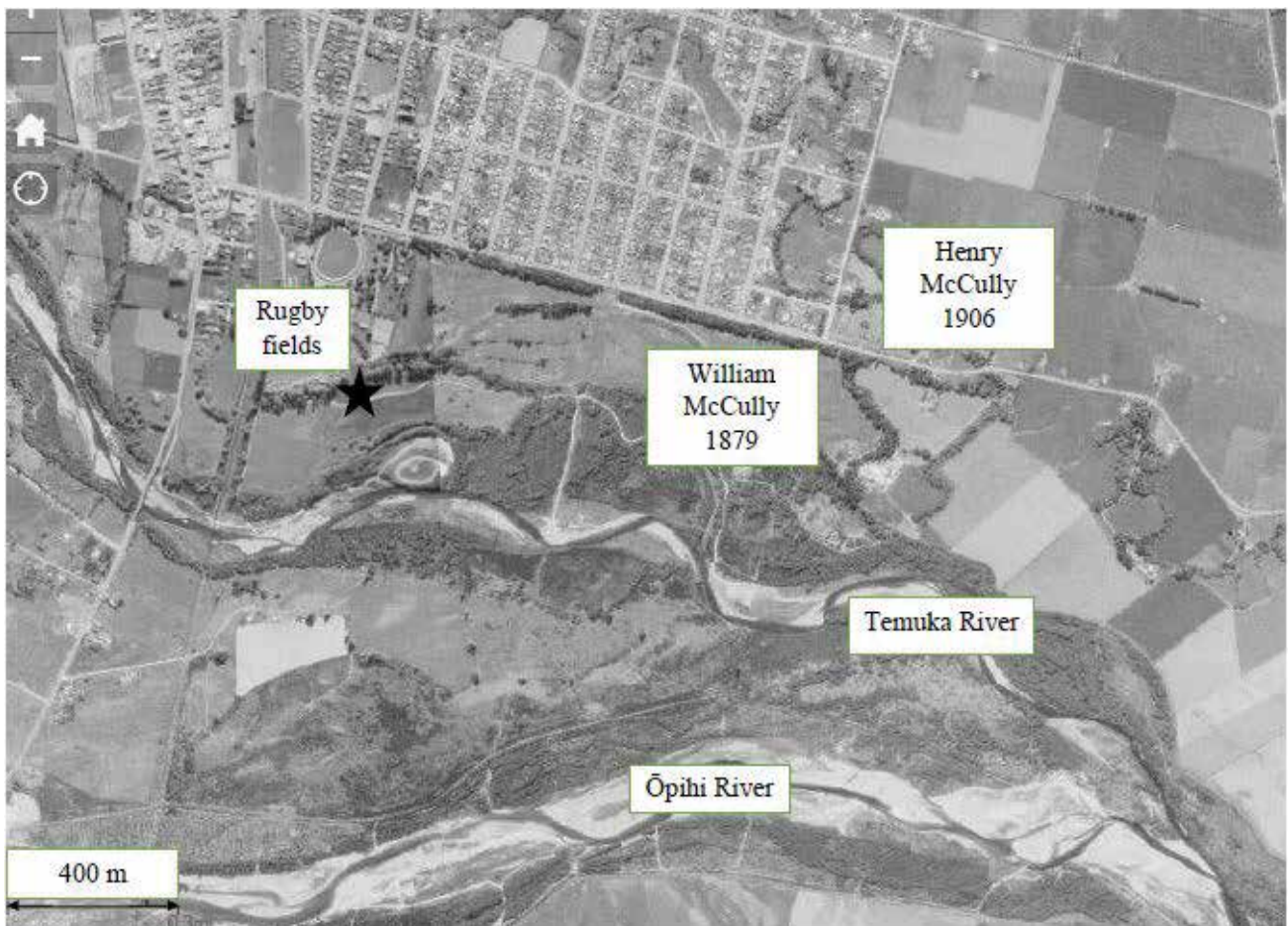


Figure 2. Aerial view of Temuka Domain and Temuka River, South Canterbury, 1975–1979. The star within the tree line on the southern boundary of the rugby fields marks the location of the pits. (Permission from Land Information New Zealand to reproduce photograph, and insert labels, 7 September 2020, <https://apps.canterburymaps.govt.nz/CanterburyHistoricAerialImagery/>)

Repurposing the Domain Site, 1870–1931

Between 1870 and 1931, the domain site was comprehensively remodelled by the Temuka County Council and the Domain Board. In the early 1870s, Canterbury Provincial Council made annual grants of £100 to £300 for tree planting (*Timaru Herald*, 30 December 1872: 3; 13 February 1874: 1) to beautify the western half of the then treeless domain and a curator started residing on-site in a £250 cottage from 1874 (*Timaru Herald*, 1 April 1874: 3). In 1879, William McCully, Hugh's much older brother, leased the eastern half of Temuka Domain (Fig. 2) for £330 per annum (*South Canterbury Times*, 12 December 1879: 2) and reaped 90 acres (36 hectares) of wheat and oats (*Temuka Leader*, 11 January 1881: 2).

European settlers first started to live in Temuka in 1853. The township was gazetted as Wallingford in 1858 and surveyed in 1863. The pits in Temuka Domain were not made by European settlers, the Temuka Road Board, or the Temuka Domain Board. According to Taylor (1952: 169), Ti Muka Pā and Upoko Pipi Pā once stood in Temuka Domain. The pits pre-dated Pākehā settlement of the area and could have been made during early Waitaha occupation, or later Ngāti Māmoē or Ngāi Tahu times. They are close to a water course that is now dry.

In 1888, Hugh McCully (1878–1967) arrived in New Zealand. He lived in Springfield Road about 3 km from the domain, played in the pits and started collecting pounamu (greenstone) and artefacts in the domain, aged 9½. In 1958, McCully told the *New Zealand Free Lance* (21 February 1958: 17):

It began before I reached the country, really. It began when I was a boy. My brother had been to New Zealand and he brought home some greenstone he had turned up on Temuka Domain. I was about nine and at an impressionable age, and it happened we were coming out to New Zealand and I resolved to myself I would collect more greenstone for myself.

Hugh McCully explored Temuka Domain from 1888 onwards.

In 1875, the Temuka Rugby Club was founded (<https://www.temukarugby.co.nz/>) and by 1883 it was holding weekly rugby practice sessions in the domain (*Temuka Leader*, 28 June 1883: 2). What Hugh McCully believed was once a kūmara garden became football field No. 2 (Fig. 3). Somewhat unexpectedly, the then very visible



Figure 3. Football field No. 2. A full-size and a three-quarter size rugby field shared this area with the motor camp from 1931 onwards. (Photographed by Rosanna McCully McEvedy with permission of the manager of the holiday camp. This photograph may be reproduced providing the photographer, authors and *Records of the Canterbury Museum* are acknowledged)

pits on the southern edge of the rugby fields survived for another 50 years until 1931.

The Formation of Hugh McCully's View on the Pits

Hugh McCully was a South Canterbury farmer and amateur archaeologist who invented 11 agricultural machines. He amassed several archaeological collections which are now distributed among five New Zealand museums. His chief archaeological interests were rock art, the mechanics of stone tool manufacture (McCully 1941, 1943b, 1943c, 1947, 1948) and excavating moa-hunter sites from Greenhills (Southland) to Cape Campbell (Marlborough). He spoke te reo Māori. In spring 1926, McCully discovered the 150 acre (60.7 hectare) moa-hunter camp at the mouth of the Waitaki River (Buick 1937: 143; McCully 1951: 2), and in the same year he formed a view that the pits in Temuka Domain were associated with kumara cultivation. He was not alone in this view (Fig. 4).

McCully had read Rigg and Bruce's (1923) article on the gravelled soils of the Waimea Plain, Tasman Bay. Their photograph (following p. 88) of a large hillocky gravel pit about 1 m deep caused him to look with renewed interest at the pits in Temuka Domain. McCully also read *Maori Agriculture*, and Best's (1925: 276) translation of Hone Tare Tikao's (1850–1927) words reinforced his interpretation of the pits:

Regarding the kumara and the pora; these were prized food plants grown by my ancestors in olden times in their cultivations at Kaiapoi, Waikakahi, Taumutu and Wai-a-te-ruati.

To the Editor of the "Timaru Herald."
 Sir.—"Vox Populi's" letter in last Tuesday's issue, re the native portion of the Temuka Domain, shows what can be in the way of bringing a little bit of the "bush" to our very doors. Like him, I think the native sections of our Parks worthy of every inch on which they grow. The Temuka Domain is an interesting place in more ways than one. There, in the olden times, just behind the native shrubbery, the Maori grew the kumara, and the pits from which they procured the shingle necessary to the cultivation of this tropical plant are still to be seen. Their settlement was on what is now the golf links, whilst almost alongside the Soldiers' Memorial a sanguinary fight took place, and near the grandstand the vanquished paid the extreme penalty of defeat. These little bits of native history are worth recording and to those who know this the native section in the Temuka Domain is an interesting locality, unique in its setting.—I am, etc.,

No. 11.

Timaru, February 15.

Figure 4. Letter to the editor, *Timaru Herald* (16 February 1928: 3). In 1928, the Soldiers' Memorial was located just inside the South African War memorial gates, opposite Whitcombe Street, and not in its present location. (Reproduced with permission of stuff.co.nz, 6 April 2021)

The authors obtained a copy of Tikao's (1918) letter to Elsdon Best which says:

Mo te Kumara me te Pora. He tino Kai enei e toua ana e ahu Tipuna ki a ratau ngakinga [sic] i nga ra o mua, i Kaiapoi, i Wai Kakahi, i Taumutu, i Te Waiteruati [sic].

McCully checked the soil in the football fields and found fine gravel had been added to football field No. 2. McCully (1943a: 6) was quite clear that “only fine shingle was used and the large stones ... were discarded” in a nearby third pit “in good condition ... across the track near a low terrace”. He asked some elderly Temuka Māori, contemporaries of Tikao, if kumara had been cultivated in the domain and his “inquiry from aged natives elicited that they had heard, when young, kumara [sic] had been grown there” (Hardcastle 1927: 7).

Early in 1927, he took John Hardcastle to examine the soil in the football fields and look at the adjacent pits because Hardcastle (1889, 1890a, 1890b, 1908) was a loess expert and Temuka Domain soil is loess (Schmidt et al. 2005: figs 1 and 5). It was John Hardcastle (1890b) who reported that loess deposits record climate swings into and out of glaciation, a world-first observation according to McSaveney and Nathan (2006). Hardcastle (1908) was also the first to describe shallow, closed, water-filled depressions in loess and these have been named Hardcastle hollows by geologists in his honour (Fagg and Smalley 2018). McCully respected Hardcastle's knowledge of the properties and characteristics of loess. After inspecting the pits and the soil in the football field,

Hardcastle (1927: 7) wrote the “*gravel pits and gravelled soils* in Temuka Park showed that kumara [sic] had been cultivated there” [emphasis added]. While Hardcastle could have been influenced by McCully, who assigned a horticultural purpose to the pits, he would have formed an independent, expert opinion on whether or not gravel had been added to the loess in the football field.

In February 1928, an anonymous correspondent to the local newspaper, simply referred to as “No. 11”, provided information on the pits in Temuka Domain (Fig. 4). The “native shrubbery” mentioned in the letter was established in 1910 by Thomas Gunnion (*Timaru Herald*, 13 December 1912: 6), a former Mayor and member of the Domain Board for many years. William Taylor and Johannes Andersen (author of the *Jubilee History of South Canterbury*), Hugh McCully, Mrs Hayhurst (then owner of the *Temuka Leader*) and Thomas Gunnion all possessed the level of knowledge demonstrated in the letter. Correspondent No. 11 remains unidentified.

Destruction of the Pits and Teviotdale's Just-in-time Visit to Them

To take advantage of the emerging camping trend at the time, a committee was set up to establish a motor camp in the domain (*Temuka Leader*, 27 September 1930: 2) and this decision triggered a chain of events which led to the destruction of the two pits. First, from September 1930 the rugby fields became a dual-purpose facility, then they were repurposed between May and September 1931. David Teviotdale was fortunate that McCully took him to see the pits on 19 March 1931, immediately prior to introducing him to the Waitaki moa-hunter camp

March 19th Mr McCully took me to Temuka and showed me where the maoris used to grow Kumara and some large gravel pits where they took the gravel to cover the beds. Then to the old pa where the entrenchments are very distinct and well preserved. A farmer there gave me Mr McCully a very fine maori grindstone from thence we went to Greenstone Island which was also stockaded at one time. I found a hammer stone & Mr McCully a flint knife and a basalt scraper. We had lunch at Temuka & returned to Timaru and Mr McCully

Figure 5. Part of Teviotdale's diary entry for 19 March 1931. (Reproduced with permission of Hocken Collections Uare Taoka o Hākena, University of Otago)

on 20 March 1931. Teviotdale was a former farmer and amateur archaeologist who had been appointed to an archaeological position at Otago Museum by H D Skinner in 1929 (Skinner 1958: 321). Teviotdale's duties included "clerical work on the registration of anthropological material, and collecting work either alone or as member of an excavational party" (Skinner 1958: 321).

Teviotdale's 1931 diary entry (Fig. 5) displays no firm personal commitment to the notion that kūmara were cultivated in Temuka Domain – he merely repeats McCully's views – but his comments in 'The material culture of the moa-hunters in Murihiku' indicate he did, post-visit, form a conclusion that kūmara were once grown in Temuka Domain. He went further and attributed the pits not to Archaic Period Māori (moa-hunters/Waitaha) but to Classic Period Māori (Ngāti Māmoe and Ngāi Tahu) (Teviotdale 1932: 92):

[Kūmara] was grown, but with difficulty, at Temuka, as the pits from which gravel for the fields was drawn are still to be seen there. These pits, which are probably of a much later date than the moa-hunters, are now being filled in in making improvements to the Temuka Domain.

By May 1931, the smaller, less hillocky pit had been "filled in and levelled off" (*Temuka Leader*, 9 May 1931: 3). Potentially, some buried surface features could remain. The *Temuka Leader* (9 May 1931: 3) also recorded the larger hillocky pit was being:

...converted from a rather unsightly and irregular hollow to an attractively laid out rockery and shrubbery. The bottom of the depression has been levelled and formed into a bed with a path completely encircling it, and around the top shrubs and pussy willows have been planted ... Later it is intended to place three garden seats in the bottom of the depression, out of the sloping sides of which the places for the seats will be dug. Steps [Fig. 6] will lead down to the bottom garden and the seats ... The garden will be planted with several big trees.

In August 1931, a shelter belt was planted on the southern boundary of the motor camp (*Temuka Leader*, 27 August 1931: 2) and this treeline (see Fig. 2) physically and visually separated the "unsightly" pits from motor camp patrons. Levelling of the larger pit and gardening activities reduced its depth, but its sloping sides were retained to provide wind protection for the garden seats. This bigger pit also accommodated domain-sized flower beds, an encircling shingle path and several trees. The

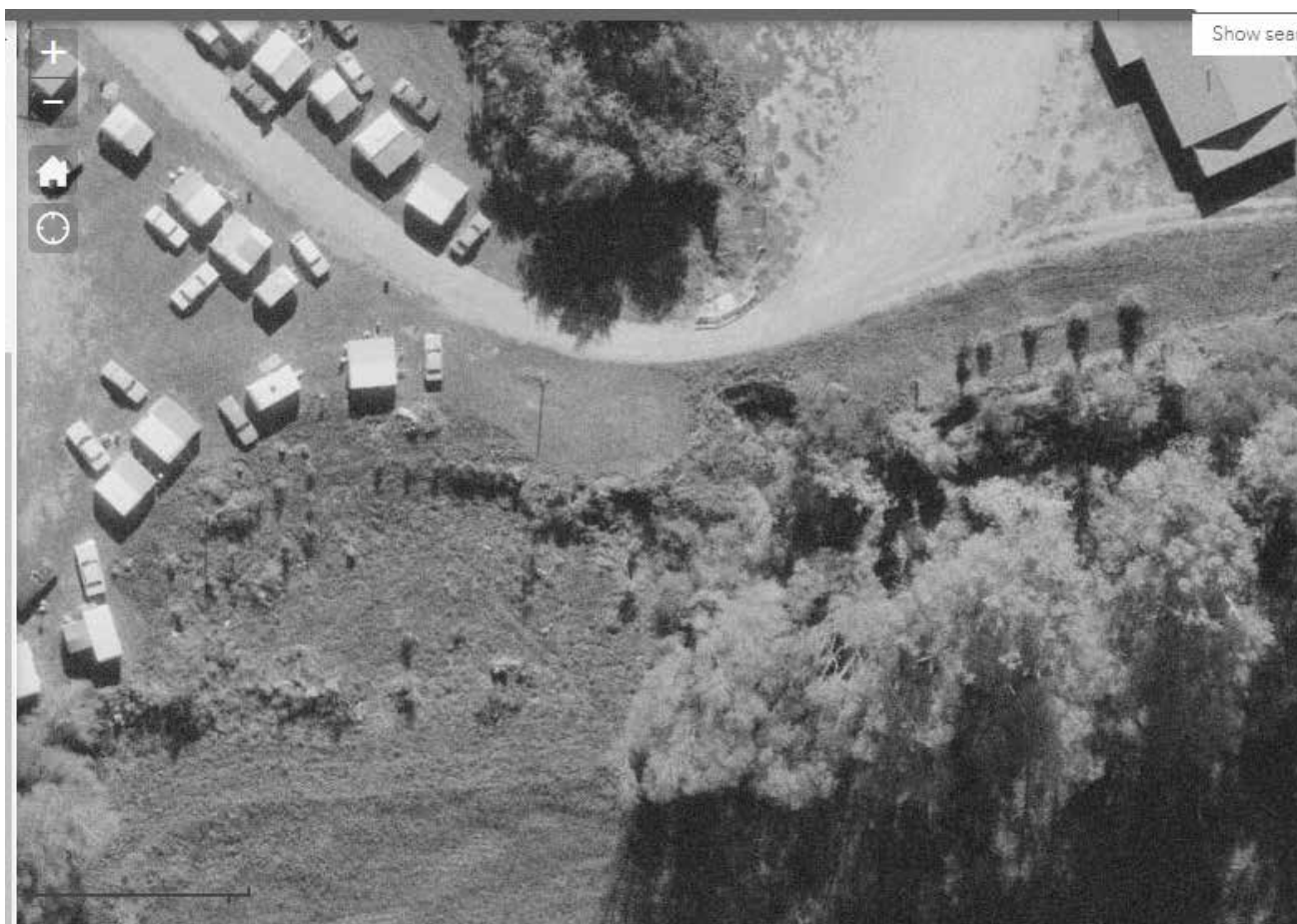


Figure 6. Relict outline of the larger pit exposed in an aerial view of Temuka Domain 1975–1979. The faint scale line, bottom left, is 20 metres. (Reproduced with permission of LINZ, 7 September 2020. <https://apps.canterburymaps.govt.nz/CanterburyHistoricAerialImagery/>).

rockery was not constructed (*Temuka Leader*, 6 August 1931: 3). By March 1932, beds of colourful annuals, designed to attract campers, had been established (*Temuka Leader*, 17 March 1932: 2). In 1933, the *Timaru Herald* (3 February 1933: 12) recorded:

The sunken garden has this year afforded proof of its popularity. The sunken garden is a mass of gay blooms and the alpine plants on the upper banks are all showing rapid growth.

The transformation of the larger pit into a landscaped, European sunken garden was complete.

However, the sunken garden area was removed in the late 1970s and the relict outline of the former pit was revealed (Fig. 6). The small circular hollow in the middle of Figure 6 marks where “rough hewn concrete steps” (*Timaru Herald*, 15 October 1931: 12) led down into the sunken garden/pit. The pit was approximately 50 by 25 metres (1,250 m²), or about a quarter acre (1,101.74 m²) according to the *Timaru Herald* (31 October 1931: 12), and was bigger than the largest 40 by 15 metre kūmara gravel pit at Woodend, near Kaiapoi (Walton 1985). However, it was far smaller than the pits described by Elsdon Best (1925: 122-123) in the Waimea-Brightwater area, Tasman Bay, one of which measured 200 yards by 70 yards by 6 feet deep (182 metres by 64 metres by 1.82 metres) and covered 3 acres (1.21 hectares), and another which extended over 8 to 10 acres (3.2 to 4 hectares) and was 10 feet (3.04 metres) deep. The size of the smaller pit in Temuka Domain is unknown.

The Site Today

The authors first walked the area on 30 July 2020 and again with the manager of the motor camp on 22 September 2020. On 21 January 2022, they visited the three football fields in the domain accompanied by a long-standing member of the Rugby Club who identified football field No. 2, showed them where the Soldiers’ Memorial was located in 1928, and pointed out a spot (about 300 metres from the pits) where local folklore says a pā (kaika) once stood.

A curved embankment approximately 60 cm high (Fig. 7) forms the southern boundary of the motor camp and is the remnant of the sloping side of the larger pit. A small, now-dry water course (Fig. 8) is on the eastern side of football field No. 2 and could have been a convenient source of water if kūmara, or any other horticultural crop, had been grown on the football fields.

In 1943, Hugh McCully confidently expected to see gravelled soil revealed in football field No. 2 after ploughing. “The No. 2 football field is to be ploughed this year, and in places the added shingle should be observable,” he wrote (1943a: 6). McCully’s claim was very public and open to wide scrutiny and verification. Whether the gravelled soil is still in situ in 2022 is unknown because the topsoil may have been stripped anytime between 1943 and today. The matter requires archaeological confirmation.



Figure 7. An embankment, approximately 60 cm high, was the sloping side of the larger pit. The car is parked on the levelled floor of the larger pit. (Photographed with permission of the manager of the holiday camp. Photograph by Rosanna McCully McEvedy. This photograph may be reproduced providing the photographer, authors and *Records of the Canterbury Museum* are acknowledged)



Figure 8. Small, now-dry, water course on the eastern side of the motor camp, close to the pits. (Photographed with permission of the manager of the holiday camp. Photograph by Rosanna McCully McEvedy. This photograph may be reproduced providing the photographer, authors and *Records of the Canterbury Museum* are acknowledged)

Summary

Tikao (1918), and some elderly Temuka Māori who were interviewed by McCully in 1926, thought kūmara had been cultivated in the Temuka area, but whether the two large pits in Temuka Domain pre-dating European settlement of the area were associated with kūmara cultivation is unconfirmed. The age of the pits' formation is not known. Hugh McCully thought they were pits from which fine gravel was taken to lighten the soils or mulch kūmara plants in football field No. 2. Beside football field No. 2 is a now-dry water course which could once have supplied water for horticultural purposes. Several of McCully's contemporaries (Hardcastle 1927: 7; the anonymous newspaper correspondent No. 11; Teviotdale 1932: 192; Duff 1963: 33) agreed with his interpretation of the horticultural purpose of the pits. With eye-witnesses dead, later archaeologists disputed the existence of kūmara pits or gardens at Temuka, dismissing claims about kūmara cultivation at Temuka as "unconvincing in the absence of pits or any made kumara soils" (Simmons 1969: 14) and concluding "this furthest extent of kumara [sic] cultivation must be regarded as dubious" (Law 1969: 226). Sixty-eight years later, Trotter and McCulloch (1999: 130-32) described the pits at Temuka as "mythical" and insisted there was no kūmara cultivation south of Taumutu, on the southern shore of Te Waihora (Lake Ellesmere). However, the recent discovery of kūmara storage pits at Pūrākaunui (45°75'S) in Otago dated to 1450 (Barber and Higham 2021) shows that the crop was at least being stored further south and may yet give some support for revisiting ideas of the southern limits of pre-European

horticulture. If so, Hugh McCully's interpretation of the pits may be useful for understanding southern Māori history. In the meantime, the pits and football fields are an archaeological site not yet investigated.

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Ladysmith Cake Recipe Remixed: A Story about a Culinary Memorial with a Difficult Heritage

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This article considers the connections between food and memory. It examines the food folklore behind the idea of the Ladysmith Cake recipe to demonstrate how specific national confections function as vehicles for collective commemoration and war memory. The recipe's eponymous title refers to the Siege at Ladysmith (November 1899–February 1900), a significant event in the British Empire's Second Boer War (October 1899–May 1902) experience – now referred to as the South African War. Therefore, this recipe commemorates New Zealand's first major offshore military engagement, making Ladysmith Cake an edible war memorial. The recipe, which developed sometime in the early 1900s somewhere within the New Zealand community (the exact date is still unknown) results in a delightful jam-filled batter cake, with walnuts sprinkled on top. It evolved when the mythos that New Zealand households had access to affordable everyday ingredients – butter, eggs, flour, nuts, raising agents, sugar and spices – combined with the desire to express a national identity. Examination of select New Zealand-published cookbooks held in Canterbury Museum shows that by the 1930s Ladysmith Cake recipes – and a couple of other South African War confections – appeared as often as recipes for the better-known World War One food memorial, the Anzac Biscuit. When Ladysmith Cake recipe ideas went online, food websites posted images of the cake and commented on the recipe's connection to the South African War. Who knows why the Ladysmith Cake recipe endured in cultural memory when other South African War confections did not? However, given the Ladysmith Cake recipe's endurance in cultural memory, food historians, cake bakers and recipe sharers everywhere need to remix in the more difficult or hidden aspects associated with this unique confection's heritage. Therefore, this article utilises the dark heritage framework, which is often focused on sites where trauma took place at a certain time, to examine the evolution of the recipe and discuss how its transmission, and the social practices wrapped around it, can play a pivotal role in fostering deeper conversations about inclusion.

Keywords: culinary nationalism, dark heritage, food folklore, Ladysmith Cake, Second Boer War/South African War, war remembrance

An Introduction to Historic Recipes

Throughout history humans have ascribed meanings to food beyond its nutritional value. Some foods become iconic or powerful symbols (Berg 2003). At first iconic foods symbolised the sacred; then with the separation of church and state, iconic foods symbolised nationhood. This article considers the food folklore behind the idea of the Ladysmith Cake recipe to demonstrate how specific national confections function as vehicles for collective commemoration and war memory (Burke et al. 2021). The recipe makes a delicious jam-filled layered batter cake made in the Anglo-American cooking tradition (Weaver 2003; Davidson 2014: 128–130). Its eponymous name commemorates the Siege of Ladysmith, one of three sieges that occurred “in the first phase of the South African War (11–31 October 1899)” (Spiers 2020: 1). Also known as the Second Anglo-Boer War, it was New Zealand's first offshore military engagement and the experience influenced ideas of national consciousness, its memory evident in cookery books. This article connects to the larger theme of food and memory and combines ideas of culinary nationalism (Ferguson 2010) with a dark heritage framework (Thomas et al. 2019; Bond and Carr 2020) to explain why remembering the less glorified aspects of a recipe's history matters (Cedro 2019). Dark heritage tourism is often focused on sites where trauma took place at a certain time, however

the framework is also useful to examine the evolution of the recipe, its transmission, and the social practices wrapped around it, to foster deeper conversations about social resistance and inclusion (Thomas et al. 2019; Bond and Carr 2020).

To set the scene, the recipe's connection to Ladysmith (a small township in northern Natal annexed by the British in 1850) and its role in the South African War is outlined. Next is a discussion about women's relationship to food and war, including explanation about why eponymous recipes exist and how, over time, the Ladysmith Cake recipe endured in cultural memory (as an edible war memorial) when other contemporary South African War confections did not. That the recipe idea – described by Linno Yum (2010) a Tongariro-based food blogger as her go-to afternoon cake – has existed for 120 years provides opportunity to remix in the more difficult or forgotten histories into this unique confection's cultural narrative.

When Did the Idea of a Ladysmith Cake Recipe First Enter Food Folklore?

Food folklore is the cultural narrative created to explain the origins of nationally distinct recipes. These

narratives mix local, commercial, community and scholarly knowledge that evolve alongside any recipe adaptations (Smith 2001; Leach 2005; Ferguson 2010). The study and preservation of such distinct historic recipes fits UNESCO's intangible cultural heritage framework (UNESCO n.d.). Intangible heritage has its roots in the folklore revival that happened in late nineteenth-century England and Europe and lasted until the 1920s and 1930s. Studies into various folk traditions were conducted at a regional level and were used as a method to foster national identity. Some studies looked at national handcraft traditions, such as Tanya Harrod (1999) who focused on England, and Palmsköld and Rosenqvist (2018) discuss similar developments in the Swedish national handicraft movement. Priscilla Ferguson (2010) looks at French cuisine, which brings together many different regional cooking styles and its relationship to French history. Ferguson's article is useful to understanding how national history and national cuisines are indelibly linked, showing how interwar period cookery books and cooking demonstrations played a key part connecting food to place (Ferguson 2010). Interest in culinary nationalism extended into the twenty-first century, from "Austria to Singapore, from Norway to Brazil, culinary countries vaunt their edible traditions and indigenous foods to promote both tourism and exports" (Ferguson 2010: 105). The scholarship of food historians has also boosted contemporary interest in culinary nationalism.

Food historian David Veart (2008) believes the Ladysmith Cake recipe is unique to New Zealand. In his view, New Zealand women demonstrated their allegiance to the British Empire by appending a patriotic title to a recipe to celebrate the liberation of Ladysmith (Veart 2008: 223–224). Ladysmith was a small yet vital border town that, like Mafeking (now called Mahikeng) and Kimberly, the "Diamond City" (Spiers 2020), fell under siege for several months during the Second Anglo-Boer War. Each town cut from essential supply routes put enormous immense stress on the residents. When liberated, there were exuberant celebrations around the British Empire (Wainwright 1997; Spiers 2020).

Veart's folklore about the origin of the idea of a Ladysmith Cake recipe demonstrates how women play a role as "imperial agents" (Pickles 2009); in this instance, how women supported and commemorated war through food. This practice was observed during the American Civil War (1861–1865) when women compiled fundraiser cookery books with proceeds supporting the war effort. After the war, fundraiser community cookery books contributed to memorials, medical services for soldiers, and welfare for war pensioners and their families (Longone 1997). Women leveraged their position as a bereaved fiancée, sister, mother or widow, as a means to boost sales. Fundraiser community cookery books were soon published in colonial New Zealand.

The food folklore of the Ladysmith Cake recipe serves to connect New Zealanders to a significant military event in a foreign place. When and where the recipe first emerged remains mysterious. It evolved within the New Zealand community in the early decades of the 1900s. The idea of Ladysmith Cake was transmitted via cookery demonstrations in the 1920s. For example, in 1924 Miss Walton's Palmerston North Municipal Gas Department cooking demonstration menu items included: "Cambridge Entree, Ladysmith Cake, Queens pudding and meringues" (*Manawatu Times*, 25 November 1924: 1). These baked goods did not go to waste; sometimes samples were passed around for the public to try, and in this instance Walton's goods were sold at the event (*Manawatu Standard*, 27 November 1924: 2). New Zealand's gas and municipal electric companies also published promotional cookery books with instructions on how to use the new cooking appliance and included already familiar recipes to help customers gain confidence. Therefore, the recipe would most likely have first appeared in a compiled community cookery book.

The Ladysmith Cake recipe reproduced in Veart's book is an early example, published c. 1929–1930 in the *New Zealand Women's Household Guide*, a compiled community cookery book that was distributed by members of the Women's Division of the New Zealand Farmers' Union (Veart 2008: 224). A Mrs W F Poppelwell from Balfour, a small farming community in the south of the South Island, provided the recipe. The recipe included a note to ice the cake when cold with coloured icing. Until the late nineteenth century icing was reserved for special occasion cakes; often made from a combination of marzipan and white royal icing to cover a rich dark Bride or Wedding Cake made with yeast and dried fruits (Charsley 1992; Davidson 2014: 866–867). In contrast, Poppelwell's icing targeted the domestic cook and involved mixing some hot water, a knob of butter and icing sugar together; in addition to colour, glaze icings were also flavoured.

Why Some Recipes Get Eponymous Titles

While there is a long tradition of associating the kitchen and cake baking as a women's domain (Holtzman 2006; Santich 2012), and women played an active role in early development of the idea of the Ladysmith Cake recipe, men also created new recipes and named them after events, people and places (Westney 2007). As Lynn Westney explains, sometime in the 1600s chefs who cooked for the nobility and other powerful patrons popularised the practice of giving eponymous titles to new recipes. Once the new recipe idea had 'fixed', the chef named it so that it could be replicated and remembered, such as Auguste Escoffier (1846–1935), the famous French-born chef who "christened the most dishes with female names" (Westney 2007: 277, 283). In the early 1890s, Escoffier named a dainty dessert *Pêches*

à la Melba after the Australian opera diva, Dame Nellie Melba, when she stayed at the Savoy in London where he worked as a chef (Davidson 2014: 607; Myhrvold 2022). In general, men ruled these high-status kitchens. From the 1800s, better access to education for women combined with a dramatic increase in cookery book publishing in Europe, Britain and America targeted at national citizens rather than the elite (Katz 2003). Informed by motion studies and standardised measures, recipes became more methodical and scientific as it was thought to produce more consistent and tastier results (Veit 2017), yet left room for local and regional innovations, some with eponymous titles. By the 1900s new recipe titles celebrated military leaders (e.g. Napoleon Cake), long-serving monarchs (e.g. Victoria Sponge), and another dish named after Dame Nellie Melba (Melba Toast).

Eponymous recipe titles soon showed up in the colonised territories of Australia and New Zealand. In the early decades of the twentieth century Australasian home cooks had access to locally supplied butter, eggs, flour and commercial raising agents, in addition to goods sourced from around the British Empire like raw cane sugar, cinnamon, and vanilla (Mintz 1986; Katz 2003; Bickham 2008; Walvin 2017). Regional innovations such as Anzac Biscuits, Lamingtons and Pavlova, that have endured in New Zealand and Australian food folklore, used these ingredients. These regional recipe innovations were both simultaneous and collective; people swapped ideas through their social networks, sampled variations at cooking demonstrations and saw prizeworthy examples on display at agricultural shows (Leach and Inglis 2006; Leach 2008; Symons 2008; Santich 2012). As identity markers, these distinct regional recipe ideas built on old and familiar cooking traditions (Ferguson 2010). Furthermore, recipe titles linked to important events, people and places over time started to function as vehicles for collective commemoration and to boost ideas of nationalism (Westney 2007; Cedro 2019). As Westney argues, “understanding of the origins of recipe names and naming practices contributes to the overall understanding of their place within culinary history and culinary onomastics” (Westney 2007: 277).

Anthropologist Jon D Holtzman (2006) notes that another useful framework is to view food nationalism as an invented tradition that fosters an imagined community. This model has been used by food historians in their analysis of the Anzac Biscuit recipe (e.g. Supski 2006; Copley 2016; Cedro 2019). Food nationalism reached a peak in the 1920s–1930s interwar period whereby cookbooks promoted national diets (Holtzman 2006: 368–367) made with regional ingredients. Interwar period cookbooks also present explicit gendered and heteronormative images of who is in the kitchen (Cedro 2019: 230). Taken together, reading historic cookbooks and recipes run the risk of presenting “a past that never was” (Holtzman 2006: 372) using “a nostalgia-tinged

lens” (Cedro 2019: 230). But food is such a powerful vehicle as it evokes the senses. Studying heritage foods such as Ladysmith Cake traverses the divide between the private and public sphere which provides very useful insights into collective memory and national identity (Holtzman 2006: 373).

Lamingtons, Anzac Biscuits and Pavlova are Australasian culinary innovations that have endured in New Zealand and Australian food folklore. The origin of the Lamington is somewhat unclear. The recipe first appeared in 1902 in *The Queenslander* (Gollan 1978; Symons 2008; Santich 2012). One narrative links to Lady Mary Lamington, wife of Baron Lamington the Queensland Governor from 1896–1901, who in 1900 supported the Brisbane Technical College cookery classes. Another account makes Governor Lamington’s cook or maid servant the inventor of the tasty confection; when preparing a supper reception at the Governor’s home, a sponge cake broke into pieces, which spurred the cook to find an edible solution (Santich 2012). Variations of recipes in printed cookery books are a sign of acceptance (Bickham 2008); a variant of this recipe with a different spelling ‘Leamington cakes’ was also circulating in New Zealand in the early decades of the 1900s (Symons 2008). Another sign of acceptance is the Australian adoption of National Lamington Day, celebrated on 21 July since 2006 – today, participants are encouraged to use the tag ‘#NationalLamingtonDay’ on social media. While the origins of National Lamington Day are unclear, its purpose is to promote the idea of the Lamington as an Australian brand or product and thus a marker of national identity (National Day Calendar 2013–2022a). Lamingtons are also made on 26 January, Australia Day, a public holiday that recognises the date Britain colonised the Australian continent in 1788 (National Day Calendar 2013–2022b).

The Anzac Biscuit recipe, named after the Australian and New Zealand Army Corps (ANZACs), links Gallipoli to the home front (Reynolds 2018). Helen Leach views Anzac Crisps, published in the 1918 edition of the Dunedin St Andrew’s Cookery Book, as the protean Anzac Biscuit recipe (Leach 2017), and the recipe idea soon transferred to Australia (Supski 2006; Symons 2008; Santich 2012; Copley 2016; Cedro 2019). The recipe is similar to other rolled oat biscuits: melt together butter and golden syrup, a semi-refined sugar syrup like maple or corn syrup, and a good binding agent (Reynolds 2018). Next, baking soda dissolved in some hot water is added to the warm syrupy mixture making it foam and creating the distinct Australasian Anzac Biscuit taste. Oats give the biscuit texture and additional nutrition (Reynolds 2018). Other Anzac recipes like Anzac Kisses appeared in Australasian cookery books during World War One and until the 1930s (Gollan 1978: 53). As ephemeral cultural objects, not all recipes take hold in the national imagination. With time the Anzac Biscuit recipe became a collective

memory object; each year, in the lead up to the annual memorial services throughout New Zealand and Australia on 25 April, journalists, food experts, historians and individual members of the community commemorate its origin and relive its legacy.

The Pavlova recipe made a moulded jelly dessert (when gelatine was sold in packages) or a large meringue cake created by a chef at a Wellington hotel in honour of Russian ballerina Anna Pavlova's 1926 Australasian tour (Leach 2008; Santich 2012). Like the Anzac Biscuit, the idea of the Pavlova meringue soon transferred to Australia (Leach 2008; Symons 2008). The recipe builds from earlier more familiar European and American Pavlova-style meringue cakes (Preston 2016). However, with time, 'the pav' shaped how Australians and Kiwis think about themselves (Ferguson 2010), and its widespread adoption and subsequent adaptations demonstrate the recipe's service to national identity.

Appending proper names to recipe titles is a tactic employed by its creator to increase its perceived value over time (Westney 2007). As collective memory objects, eponymous recipes like Anzac Biscuits, Lamingtons and Pavlova gained popularity in New Zealand and Australia during the interwar period when regionally distinct foods helped shape ideas of a national identity. Given the shared Kiwi-Australian origin of these three recipes, the absence of a Ladysmith Cake recipe in the surveyed Australian food histories above is unusual, and further research is required by someone with better access to Australian-published community cookery books. Yet this absence somehow validates Veart's claim that the Ladysmith Cake recipe idea is a Kiwi invention (Veart 2008: 20).

Dark Heritage as a Framework to Study Historic Recipes

Dark heritage is a broad concept most often associated with places that remember war, disaster, death and human suffering and includes battlefields, disaster sites and concentration camps (Thomas et al. 2019: 1). It makes a useful concept for teaching history (Thomas et al. 2019: 9). For example, Bond and Carr (2020) explore the interrelationship between dark tourism and dark heritage and show how museum spaces can engage visitors in difficult topics such as the massacre or victimisation of Indigenous people in Australia. Using the Western Australian Museum in Perth as their case study site, the museum's Aboriginal cultural gallery discusses the dark history of Aboriginal race relations in Western Australia. Co-curated with the Whadjuk Nyoongar people, the traditional owners of the land where the museum is situated, the permanent exhibition showcases their history and their diversity, but also "highlights many of the atrocities perpetrated upon them, including the imprisonment, slavery and abuse they experienced" (Bond and Carr 2020: 144).

In Bond and Carr's study, all the research participants, Aboriginal and non-Aboriginal visitors, understood that they shared a common history "at least insofar as they all had ancestors who played a role in Australia's colonial experience" (Bond and Carr 2020: 145).

Dark heritage is useful for investigating how people engage with multivocal, controversial, uncomfortable topics, but it is not limited to physical sites and can be applied to intangible heritage objects. This makes dark heritage a useful framework to study specific eponymous recipes that function as commemorative war objects. For example, Flinders University student Emma Muller explored the Anzac Biscuit's historical, social and spiritual significance as an object of war. Its historic value is connected to the ANZAC involvement in the Gallipoli campaign. The social value is related to the biscuit's role in the remembrance of New Zealand and Australia's contribution to World War One. Spiritual significance is intertwined with family memories and rituals connected to eating Anzac Biscuits or using a particular recipe (Muller 2021). However, as Amir Amirani explains, dark heritage opens a window onto "alternative or hidden histories" (in Burke et al. 2021: v), therefore an alternate social and spiritual value could extend beyond war remembrance to promote [afternoon tea] conversations about conciliation, disarmament and peace for example.

Furthermore, as Cedro (2019) points out, the nostalgic "women's comfort and reassurance narrative" that surrounds the Anzac Biscuit is just too heteronormative. "The Anzac myth' perpetuates a fantasy of national character where "[Australian] men are brave and fight/sacrifice to preserve the comfort of domestic spaces, which are coded feminine and full of caring performances" (Cedro 2019: 239). The myth offers comfort but does not provide any space for men to embrace a baking practice without "provoking social commentaries on the boundaries of gender performance". The relationship between gender and baking and "cultural conceptions of femininity, baking and sweet foods", Cedro suggests is "ready to be scrutinized further" (Cedro 2019: 240). Queer and transsexual voices will offer fresh insights into the Anzac Biscuit story, and an intersectional approach that includes class, ethnicity and religious affiliation will also draw out other hidden histories.

New Zealand's Boer War

The South African War, also known as the Second Anglo Boer War (11 October 1899–31 May 1902), was a big public event for New Zealanders and for shaping public history (Rabel 2009). The war was New Zealand's first offshore military engagement, and support for the British Empire's expansion into the mineral-rich Transvaal and Orange Free States was strong. With New Zealand's security linked to the British Empire, Premier Richard Seddon was quick to offer the colony's help (Brooking

2014). New Zealand's volunteer riflemen fought alongside Australians, Canadians and Cape Colony South Africans in the British regiment. Over 450,000 imperial and colonial troops enlisted. New Zealand's contribution included 6,500 men and 30 women who served in the Imperial Army Nursing Reserve (Crawford 2000; Ellis 2000; Brooking 2014; Ministry for Culture and Heritage 2018). New Zealanders were expected to cover expenses (National Army Museum Te Mata Toa n.d.). In addition, more than 300,000 horses served in the cavalry and as food. Only one of the estimated 8,000 horses New Zealanders sent returned home.

Māori offered to serve as a unit, but both the Crown and Colonial Office declined; however, Māori retained their dignity and engaged on their terms (Webb 2018). Individual Māori who identified as mixed race and with some form of prior military service, enlisted using anglicised names. But with no official documents exact numbers are “unquantifiable” (Webb 2018: 22–23, 29). Māori men and women also found methods to raise funds for “their troops” and support their people “at home”, such as the Ngāpuhi Nursing sisters who rode horses to help the sick and provide first aid training to the isolated Māori communities around rural Northland (Ellis 2000; Webb 2018: 29, 40–42).

Pākehā women also formed patriotic groups, such as the Girls Khaki Brigade who dressed in uniform and organised drills (Ellis 2000; Brooking 2014; Robson 2021). Women arranged galas, and sent knitted socks and scarves and baked goods to the men serving in the war.

The war took longer than expected.

The Boers' first move involved cutting off vital rail access to two British border towns in the Cape Colony, Mafeking (13 October 1899 to 17 May 1900) and Kimberly (14 October 1899 to 15 February 1900), followed by Ladysmith (2 November 1899–28 February 1900) in Natal (Spiers 2020). The sieges caused malnutrition, starvation and disease for the town residents; contaminated water in Ladysmith spread “water-borne diseases such as typhoid fever (enteric) and dysentery” (Spiers 2020: 10). In response, the British imperial forces invaded the Transvaal and Orange Free State, destroying farm equipment, burning crops and killing livestock. Such actions caused homelessness and starvation, and the captured Boers, their workers and families were bundled into segregated concentration camps (Webb 2018; Spiers 2020). More lives were lost in Lord Kitchener's experimental concentration camps than in battle (Dickens n.d.; van Heyningen 2020), whereby Black Africans in camps lived on fewer calories and were exposed to worse conditions than captured Boer refugees. Recent archaeological evidence suggests that over 20,000 black lives were lost (Dickens n.d.).

After the war, New Zealand women teachers worked in the concentration camp schools. Serving out one-year contracts they re-educated children in English using a curriculum based on British cultural values (Ellis 2000: 621). Looking back on the situation today, the way the teachers systemically eradicated the camp children of their [native] culture and language, combined with inadequate food and shelter, was a brutal criminal act against humanity of shocking proportions, but does not quite fit the United Nation description of genocide (United Nations n.d.).

Overall, 71 New Zealanders were killed in action or died from wounds in the South African War; another 159 died in accidents (16 from a single train accident) or from disease (Crawford 2000: 59–63; Ministry for Culture and Heritage 2018). After the war, as a marker of national identity and as a demonstration of loyalty to Empire (McFadden 2020), town centres erected public war memorials (Maclean and Phillips 1990; Rabel 2009: 246). In addition, war memorabilia, such as examples of the New Zealand Mounted Rifleman's khaki hat, entered museum collections (National Army Museum Te Mata Toa n.d.).

A Case Study Approach

This investigation into early Ladysmith Cake recipes emerged when on the eve of the Centenary of Armistice of the World War One, a search for Peace Cake recipes revealed signature recipes that fostered memories of war instead (Cobley 2018). Fieldwork was undertaken at Canterbury Museum over the summer of 2019/20 and built on earlier research at the Christchurch Anglican Diocesan Archives, Christchurch City Libraries and the Macmillan Brown Library, University of Canterbury in 2018. The goal was to find a Ladysmith Cake recipe, preferably published prior to 1920, and track its evolution.

Canterbury Museum's eclectic cookery book collection is modest in size and scope. Most books entered the Museum collection as part of a body of donated items or formed part of the Museum's library. Cookery books were sorted based on the following taxonomy: nineteenth century authored household management books; twentieth century instructional domestic science cookery books; commercial promotional cookery books and compiled community cookery books (Leach 2005; Leach and Inglis 2006). Many books were undated, but weights and measures, typeface, paper quality and advertisements provided useful contextual clues. WorldCat offered additional details sometimes missed, such as the name of the commissioned author in commercial cookery books.

The earliest cookery books in the Museum's collection were authored household management books published in the late 1800s by American, British and European

Vinegar Cake (Another Mode).

MRS. RICHARDS, N.P.

1lb. flour, $\frac{1}{2}$ lb. butter, $\frac{1}{2}$ lb. sugar, $\frac{1}{2}$ lb. currants, $\frac{1}{2}$ lb. sultanas, $\frac{1}{4}$ lb. raisins, a little lemon peel.

Put flour, sugar and fruit into a basin, rub in the butter, make a heap and a hole in centre, put in two tablespoonfuls of vinegar; next take a cup of milk, put in one desertspoonful of soda, add to vinegar; mix fairly stiff; bake from one to two hours in a good oven.

Victoria Cake.

MRS. EDWIN PERRY, Liardet Street, N.P.

Mix 2 eggs, 3 tablespoonfuls of white moist sugar, 2 teaspoonfuls baking powder, 3 tablespoonfuls flour, add a piece of butter the size of a walnut previously melted; mix well together; divide in equal parts; bake on two dinner plates or tins well buttered in a moderate oven; when cold spread a layer of jam. Cost 4d. Bake for 20 minutes.

Seddon Cake.

$\frac{1}{2}$ lb. butter, 6 tablespoonfuls sugar, 6 eggs, essence of lemon, sufficient flour to make cake mixture.

Beat butter and sugar to a cream, add one egg (unbeaten) and tablespoonful of flour alternately until eggs are all used. The mixture must not be too stiff. Add teaspoonful baking powder last, and bake about one hour.

Watermelon Cake (Very Good).

MISS MONA KING, Waihi, Auckland.

10 ozs. flour, 6 ozs. butter, 5 ozs. sugar, 3 eggs, 1 teaspoonful baking powder, $\frac{1}{4}$ lb sultanas, 6 drops essence of almond, 1 or 2 tablespoonfuls milk if necessary.

Beat butter and sugar to a cream; take about one third of the mixture, a few drops of cochineal and a few sultanas; put light colour in dish first, then pink, and remainder of white on top. Bake $1\frac{1}{4}$ hours in moderate oven.

Figure 1. Two eponymous recipes: Victoria and Seddon Cakes. *Taranaki Magic Cookery and Recipe Book* (c. 1907: 33). Canterbury Museum 161/2000 Walker LIB 30186

companies. As expected, the Museum held Isabella Beeton's epic *The Book of Household Management* (1889). Beeton's "foreign cooking section" included "Recipes for Australian Dishes" such as kangaroo tail soup, roast wallaby and parrot pie. Instructive American cookery books included *Scammell Cyclopedia of Valuable Receipts. A Treasure House of Useful Knowledge, for the Everyday Wants* (c. 1885, 1897). In addition to popular medicines made from chloroform, sulphur ether, opium and camphor gum dissolved into alcohol, *Scammell Cyclopedia's* included recipes for a 20 egg Bride Cake and Christmas Cake made with lard and yeast.

New Zealand-published domestic science cookery books, such as Elizabeth B Miller's *Cookery Book. Lessons Given at the Dunedin Exhibition and Under Auspices of the Technical Classes Association* (1890), include British and Australian influences as well as local recipes that reflected the foodways of migrants (Leach 2010: 43–5). Instructional books, like *Colonial Everyday Cookery* (tenth edition, c. 1922; fifteenth edition, c. 1933) covered recipe building (e.g. foundation batter cake), nutrition and meal planning (Miller 1890; Mitchell 2005). In 1901, New Zealand householders tended to their own

domestic duties, and when combined with the domestic helper shortage (Pickles 2009), boosted the fantasy that every New Zealand woman was practical, economical and efficient in the kitchen.

Items most relevant to this investigation were commercial and community and cookery books published from the early 1900s to 1970s. These books offered useful insights into local business, grassroots community organisations and shifts in foodways. Data gathered for this case study investigation focused on the type of cake, and details of continuities and adaptations of the recipe methods and ingredients used. As food historian Helen Leach has cautioned, it is best to treat community cookery books as assemblages; selected for the target audience rather than representative of actual contemporary diets (Leach 2005). Furthermore, as cultural products, these books were not originally destined to become museum objects, but they do make useful objects for historical enquiry. Recipes and cookery books offer a fresh perspective on how New Zealanders "engaged" with their nation and empire (Bickham 2008: 78).

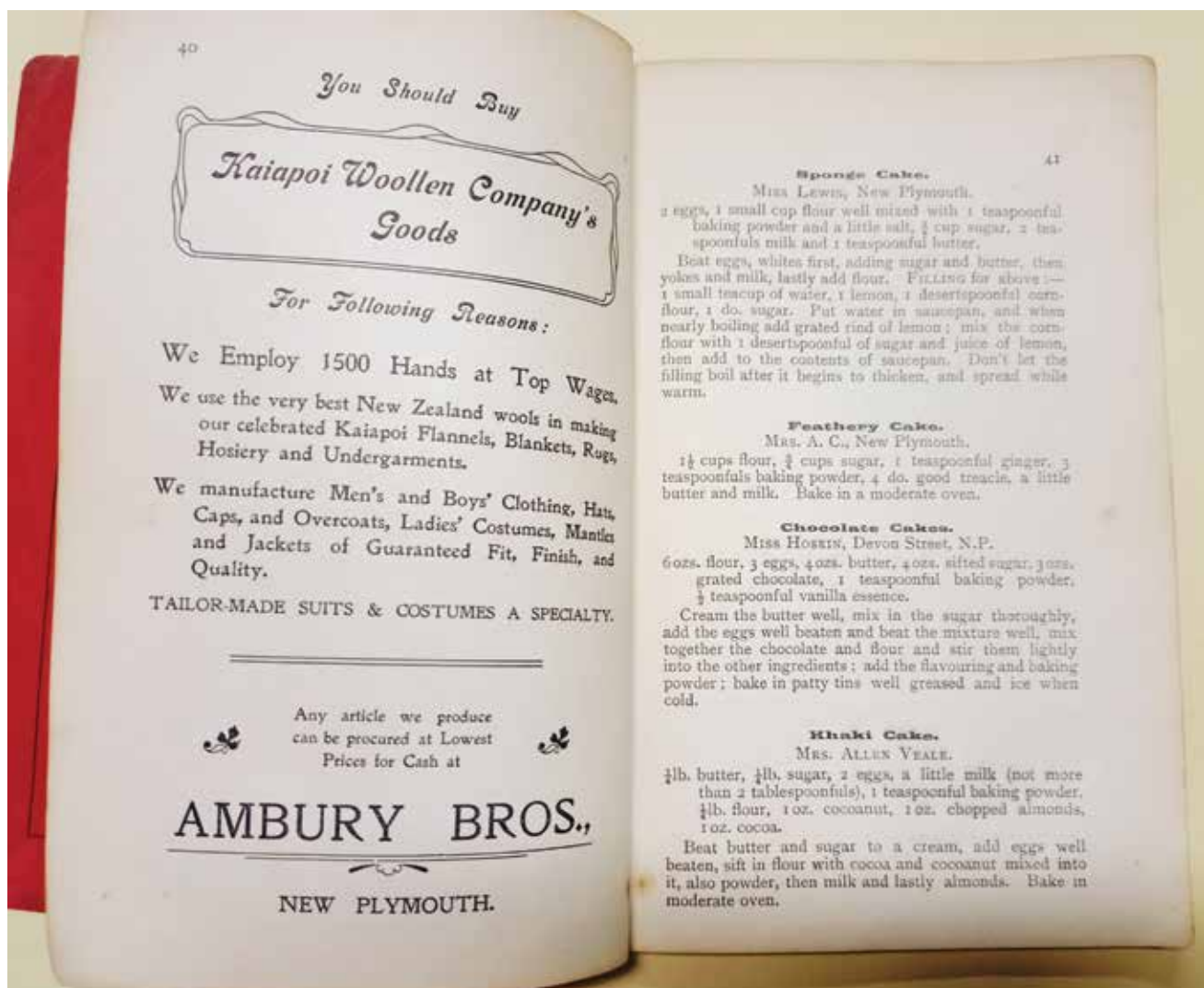


Figure 2. Recipe for Khaki Cake. *Taranaki Magic* (c. 1907: 41). Canterbury Museum 161/2000 Walker LIB 30186

Findings

The cookbooks were stuffed full of evidence of food nationalism, whereby recipes promoted national foods using local and regional ingredients (Holtzman 2006; Ferguson 2010). These books also presented clear gendered and heteronormative images of who cooked (Cedro 2019: 230). In the early decades of the 1900s New Zealand-published fundraising cookery books captured significant events of the day, some recipes served as “powerful symbols” of nationhood and empire (Bickham 2008: 74). For example, in the *Taranaki Magic Cookery and Recipe Book* (c. 1907), collated by Members of the New Plymouth Wesleyan Methodist Parsonage Fund, a recipe for Seddon Cake appeared just underneath Mrs Edwin Perry’s Victoria Cake recipe (Fig. 1). Premier Seddon died in office in 1906 (Brooking 2014), so this eponymous recipe marked an important political event in New Zealand history. Furthermore, its placement underneath a recipe for an economical yet tasty cake named after imperial figurehead, Queen Victoria, who died in January 1901 is also significant.

Local newspapers promoted the book. The *Taranaki Herald* (3 July 1907: 4) described *Taranaki Magic* as “a handy little volume” that gave “the satisfaction of helping a good cause”. Fundraiser cookery books made useful birthday gifts; Canterbury Museum’s copy has an inscription on the inside cover: “To Alice, with love and best-wishes, January 13th 1908...” To help cover printing costs *Taranaki Magic* also included advertisements such as H E Shacklock Ltd, a Dunedin-based foundry that manufactured the Orion coal range oven (New Plymouth Wesleyan Methodist Parsonage Fund c. 1907: 38).

The Khaki Cake recipe (Fig. 2) presented intrigue – does this sandwich cake pay tribute to the khaki-clad New Zealand infantrymen who served for the British Empire in the South African War, which was still a recent collective national memory? Furthermore, that various New Zealand-based patriotic women’s groups also adopted a khaki uniform and engaged in fundraisers first to support the overseas war, and then support injured soldiers and erect district war memorials (as they did in Australia [McFadden 2020]), makes the Khaki Cake patriotic-link to the South African war more possible. The mysterious origins of the Khaki Cake recipe highlights ways in which food history intertwines with food folklore.

A second South African war recipe for a large almond-flavoured chocolate Mafeking Cake (Fig. 3), supplied by Mrs F Jolly, appeared on page 83 of the *South Auckland Queen Cookery Book* (second edition 1921). The inside cover of this local celebrity fundraising cookery book featured a Raspberry Jam recipe from Lady Liverpool, written on Government House paper. Lady Liverpool lent her name as a well-known and respected figurehead

to promote the book. Again, the *South Auckland Queen Cookery Book* included advertisements, this time with a local flavour, such as Anchor brand butter made from milk supplied by Waikato’s dairy cows. With a small farmer dairy industry supporting New Zealand’s economy and even though a large portion of produce was exported back to Imperial Britain, all four recipes shown in Figure 3 provide a glimpse into how New Zealanders found ways to use their local butter: a good Madeira Cake took half a pound, Shortbread four ounces, three for Date Shortbread and Mrs F Jolly’s Mafeking Cake six. In pre-refrigerator days butter was kept in a food safe and *Colonial Everyday Cookery* (tenth edition, c. 1918–1922: 328) provided instructions on how to keep it “firm and fresh”: “Dissolve 1 teaspoon of powdered borax in 1 cup of boiling water. Soak a cloth for 15 minutes in the solution. Let the cloth cool and then place it over the butter.”

The content of the *South Auckland Queen Cookery Book* second edition was based on the first edition, published in November 1915 when a war was taking place in Europe which through its links with the British Empire, involved New Zealand. Therefore, the editions featured several new national confection recipes, including Anzac Toffee, as in 1915 the Gallipoli Campaign was still underway, and Dominion Pudding in recognition of New Zealand becoming a Dominion in 1907. It also included an Australian-style Lamington Cake recipe. This second edition was compiled by the Hamilton Carnival Tennis Queens and its objective was to raise funds to support the wounded soldiers who had returned to New Zealand in their thousands.

A recognisable form of Ladysmith Cake recipes appeared in community fundraising cookery books published from the early 1930s. Further research is required in other collections to find an earlier recipe. The *Southbridge Women’s Institute Cookery Book* (1932) recipe for Ladysmith Cake offered scant instructions, as foundational baking knowledge was assumed (Fig. 4). Like Veart’s example, this recipe suggested icing the cake when cold. The Southbridge Women’s Institute baking section, like other community cookery books of this era, is laden with nationalistic and imperial-sounding recipe titles like Anzac Biscuits, Everest Biscuits (honouring the early 1920s British expeditions), and Maori [sic] Kisses. On page 11, next to a recipe for Khaki Sandwich is a full-page advertisement for Klondyke Coal, as most rural households still had coal ranges. The advertisement tells readers to support local industry because it’s “cheap, economical” and “Canterbury’s best”.

Some community cookery books listed recipes alphabetically, but not always, however Ladysmith Cake recipes often appeared just below Khaki Cake recipes. While Ladysmith is the most common spelling, other

MADIERA CAKE (Good).

Half pound butter, 1 large cup sugar (level), 2 large cups flour (level), 4 eggs (beaten), $\frac{1}{2}$ cup lukewarm milk, 1 heaped teaspoon cream of tartar, 1 level teaspoon soda, essence of lemon or grated lemon rind. Mode: Cream, butter, and sugar, add beaten eggs gradually, then the milk and soda together (dissolved in teaspoonful of boiling water); then the flour and cream of tartar mixed together. Bake in moderate oven 1 to 1 $\frac{1}{2}$ hours. This can be made with 1 cup of stoned raisins or figs, in which case use $\frac{3}{4}$ cup sugar.

MRS. R. THORNES.

SHORTBREAD.

Four ounces butter, 2 ozs. flour of rice, 2 ozs castor sugar, 6 ozs. flour, pinch of salt. Place butter and sugar on a board and work together in palm of right hand, then gradually mix other ingredients in the same way. Place on slightly floured tin. Bake in a moderate oven for 20 minutes.

MRS. J. GORDON.

DATE SHORTBREAD.

Three ounces butter, $\frac{1}{2}$ cup sugar, 1 egg, 1 $\frac{1}{2}$ cups flour, 1 teaspoon baking powder, chopped dates. Method: Beat butter and sugar to a cream, add egg, and beat well. Then add flour and baking powder. Roll out and spread half with dates. Then cover with other half, and bake in good hot oven.

MRS. H. WINDSOR (Tamahere).

MAFEKING CAKE.

Eight ounces flour, 8 ozs. sugar, 6 ozs. butter, 3 ozs. almonds (chopped), 4 eggs, $\frac{1}{2}$ teaspoonful baking powder, $\frac{1}{2}$ cake chocolate, little essence of almonds. Cream butter and sugar, add beaten eggs, lastly flour, baking powder, and chocolate. Put chopped almonds on top.

MRS. F. JOLLY.

Figure 3. Mafeking Cake, a more ephemeral Boer war recipe. *South Auckland Queen Cookery Book* (second edition, 1921: 83). Canterbury Museum 40/96 Borgfeldt, M. LIB 26510

WOMEN'S INSTITUTE COOKERY BOOK.

LOUISA CAKES.

Four ounces butter, 4 ozs. sugar, 8 ozs. flour, teaspoon baking powder, yolks of 2 eggs.

Cream butter and sugar, add yolks of eggs, flour and baking powder. Mix to a dough, then roll out and put in patty pans. Put jam in each (just a little), then whip whites of eggs stiff and add $\frac{1}{2}$ lb. icing sugar and $\frac{1}{2}$ lb. desiccated cocoanut, and put a spoonful on each; bake in a moderate oven till meringue sets.

LADYSMITH CAKE.

Two eggs, weight in butter, flour and sugar, 1 heaped tablespoon of cornflour, small half-teaspoon soda, 1 small teaspoon cream of tartar.

Beat butter and sugar to cream, add eggs well beaten, then flour, cornflour, soda, cream of tartar. Take less than half of mixture and add 2 teaspoons of cinnamon and little flour; spread on bottom of cake tin, then layer of jam; put white part on top. Bake $\frac{1}{2}$ an hour; ice when cold.

SPONGE.

Three eggs, 4 ozs. sugar, 3 ozs. flour, 1 teaspoon baking powder.

Beat eggs, then add sugar and beat again. Add flour and baking powder. Bake in sandwich tins for 10 to 15 minutes.

WALNUT JOYS.

Quarter pound butter, 6 ozs. walnuts, 1 small cup sugar, $1\frac{1}{2}$ cups flour, 1 teaspoon baking powder, 2 teaspoons cocoa, 1 egg, $\frac{1}{2}$ teaspoon vanilla.

Beat butter and sugar, add egg, flour, cocoa, etc. Put on sides in spoonfuls. Moderate oven.

MAORI KISSES.

Half cup of sugar, 2ozs. butter, 2 eggs, 6 ozs. flour, 1 teaspoon ground ginger, 1 teaspoon cinnamon, and 1 teaspoon baking powder.

Drop in spoonfuls on cold tray. Add nuts as liked, and ice top after placing together with jam.

KISS CAKES.

Half a cup of sugar, creamed with $\frac{1}{2}$ lb. butter, add 1 egg, $\frac{1}{2}$ cup cornflour, $\frac{1}{2}$ cup plain flour, 1 teaspoon baking powder, essence.

Mix stiff and roll out thin; cut in rounds and bake 10 minutes. Place together with jam.

APPLE SHORT CAKE.

Two cups flour, $\frac{1}{2}$ lb. butter, $\frac{3}{4}$ cup sugar, 1 egg, 1 teaspoon cream of tartar, $\frac{1}{2}$ teaspoon of soda.

Rub butter into flour, add other ingredients, mix to a paste with milk and egg beaten; roll out and bake with apple between.

Figure 4. Ladysmith Cake, from novel to a now familiar recipe. *Southbridge Women's Institute Cookery Book*. (1932: 15). Canterbury Museum 154/98 Hampton LIB 28232

HAZELNUT CAKE.

Ingredients.—Four eggs, 6oz sugar, ½lb minced nuts (finely), 1 teaspoon baking powder, salt.

Method.—Beat eggs and sugar, then add nuts and baking powder. Bake in square tin for an hour. Ice when cold.

JEWISH CAKE.

Ingredients.—Quarter pound butter, 3 eggs, 1 cup sultanas, 2 teaspoons cinnamon, 1 cup sugar, 1½ cups flour, 1 teaspoon baking powder, 2 or 3 tablespoons milk.

Method.—Cream butter and sugar. Add milk and eggs well beaten, and then flour, etc., and sultanas. Bake in sandwich tins.

Icing.—Two cups icing sugar, 2 tablespoons butter, 1 tablespoon cocoa. Mix until fluffy and then add 1 teaspoon vanilla and 2 or 3 tablespoons strong coffee. (Add coffee gradually).

KHAKI CAKE.

Ingredients.—One tablespoon chopped almonds, 1 tablespoon cocoanut, 1 dessertspoon cocoa, ¼lb butter, ¼lb sugar, 1 teaspoon baking powder, ¼lb flour, 2 eggs, 1 tablespoon milk.

Bake in sandwich tin for 20 minutes.

LADY SMITH CAKE.

Ingredients.—Three eggs, weight of 3 eggs in butter, sugar and flour, 1 large tablespoon cornflour, 1 teaspoon baking powder.

Method.—Put 1½ teaspoons spice and cinnamon in half the mixture; put in tin and spread raspberry jam over and cover with other half of mixture.

LEMON CAKE.

Ingredients.—Quarter pound butter, ¼lb sugar, 2 eggs, 5 tablespoons flour, 2 teaspoons baking powder, 1 tablespoon grated lemon rind, 2 tablespoons lemon juice.

Method.—Beat butter and eggs and sugar to a cream, then add juice and rind, lastly flour and baking powder. Ice with lemon icing.

LOUISE CAKE.

Ingredients.—Quarter pound butter, 4oz sugar, 8oz flour, 1 teaspoon baking powder, pinch of salt, a few drops essence of vanilla, 2 egg yolks.

Method.—Beat butter and sugar to a cream, add yolks and essence and salt. Then add flour and powder, and press mixture into a shallow tin. Then spread with raspberry jam, then with the whites of two eggs, 5oz icing sugar, 4oz cocoanut. Bake slowly in cool oven about ½ hour or till light brown.

NUT CAKE (No flour).

Ingredients.—Two ounces butter, 2oz sugar, 5oz walnuts, 1 teaspoon baking powder.

Method.—Beat butter and sugar. Add nuts and baking powder. Bake in a slow oven 1 hour.

Figure 5. By coincidence the Lady Smith and Khaki Cake recipes are often grouped together, as seen in *St Saviour's Orphanage Cookery Book* (1939: 93). Canterbury Museum Cookery Books/Miscellaneous LIB 28253

CAKES AND BISCUITS

KHAKI CAKE •

4 ozs. Butter
4 ozs. Sugar
1 moderate tablespoon Cocoa
2 or 3 tablespoons Boiling Water
2 Eggs

4 ozs. Flour
1 teaspoon
Edmonds Baking Powder
1 tablespoon Coconut

Cream butter and sugar, add cocoa which has been mixed to a smooth paste with the boiling water. Beat well. Beat eggs and add alternately with dry ingredients. Bake 25 to 30 minutes in 6 or 7 inch greased sandwich tins at 400°F. When cold, fill and ice with Chocolate Butter Icing.

KISSES •

4 ozs. Butter
4 ozs. Sugar
2 Eggs

4 ozs. Flour
4 ozs. *Edmonds* Cornflour
1 teaspoon
Edmonds Baking Powder

Cream butter and sugar well, add eggs one at a time and beat again. Add sifted dry ingredients. Put small spoonfuls on greased trays and bake 8 to 10 minutes at 400°F. When cold, put together with raspberry jam and sprinkle with icing sugar.

LADYSMITH CAKE •

6 ozs. Butter
6 ozs. Sugar
3 Eggs
6 ozs. Flour + 1 extra tablespoon

1 moderate teaspoon
Edmonds Baking Powder
2 teaspoons Cinnamon
Raspberry Jam

Cream butter and sugar, add well-beaten eggs alternately with sifted flour and baking powder. Take less than half of the mixture, add cinnamon and the extra tablespoon flour. Spread in a greased 7 inch square tin, spread mixture with raspberry jam, put remaining mixture on top. Sprinkle with chopped nuts. Bake about 1 hour at 400°F.

LAMINGTONS •

Make Three Minute Sponge (see page 36) and cook in an oblong tin. Leave until next day, cut into squares, and dip each in chocolate icing then roll in coconut. Leave to dry.

CHOCOLATE ICING:

2 tablespoons Butter
2 tablespoons Cocoa
6 tablespoons Boiling Water

$\frac{3}{4}$ lb. Icing Sugar
Few drops Vanilla Essence

Melt butter, add cocoa dissolved in boiling water. Mix in sifted icing sugar, add vanilla essence, and beat well. About $\frac{1}{2}$ lb. coconut is required for coating.

LEMON BISCUITS •

4 ozs. Butter
4 ozs. Sugar
 $\frac{1}{2}$ teaspoon Essence of Lemon

1 Egg
8 ozs. Flour
1 teaspoon
Edmonds Baking Powder

Beat butter and sugar to a cream, add essence. Break in the egg and beat well. Add sifted flour and baking powder. Roll out thin, cut into shapes. Bake 15 to 20 minutes at 375°F. Put together with jam or lemon filling.

Figure 6. An *Edmonds Sure to Rise Cookery Book* Ladysmith Cake recipe was published for the first time in the 1950s and revised for the de luxe edition (fifth printing, 1962: 27). Canterbury Museum 287/76 Reynolds, Rosa Josephine

variations, such as Lady Smith Cake (Fig. 5) appeared in the 1937 and 1939 editions of *St Saviour's Orphanage Cookery Book*. Perhaps the compilers were cognisant of the folklore that the South African town Ladysmith was named in honour of the wife of Sir Harry Smith, Lady Juana Maria Smith.

Commercial interests supported the transmission of the Ladysmith Cake recipe. St Saviour's Lady Smith Cake recipe used 1 tablespoon of Duryea's Maizena, an American manufactured brand of cornflour imported to New Zealand in competition with British and local brands. An advertisement for Duryea's Maizena, "The World's Best Cornflour", appeared on page 72 of the 1937 edition just below a half page advertisement from Turnbull and Jones, agents for the Canadian-made Moffat electric range. The back cover featured Westinghouse refrigerators. In both editions a full colour inside flyer advertised Christchurch manufactured Edmonds "Sure-to-Rise" Baking Powder and included an easy-to-follow Madeira Cake recipe. Both gas and electric range advertisements appear in St Saviour's 1939 edition. The Christchurch Gas Co. Ltd's simple inside cover advertisement said: "Good Cookery! is Gas Cookery", and on page 78, the Christchurch Municipal Electricity Department (MED) explained that the New Zealand-made Atlas electric range was "equal to the world's best" and consumers could "be assured of cheaper, cleaner and healthier cooking". New Zealand's first state-funded power station was built in the Canterbury region at Lake Coleridge and the Christchurch City Council thought electricity must be affordable to every householder.

In the 1930s a cooking range was a big-ticket item and in relation to re-signing the Christchurch agency for the Canadian Moffat range, the City Council debated whether the MED should display and sell New Zealand-made ranges exclusively. Local Councillor, Elizabeth McCombs, who was elected in 1921, thought an embargo against the importation of cooking ranges would not bring additional jobs to the region and complicate trade relations within the Commonwealth (*Press* 1932: 9). The Council ruled not to embargo the Moffat stove and one copy of Mrs D McGill's *Moffat's Cookbook* (1926) found its way into Canterbury Museum's collection.

By the 1950s, variations of the Ladysmith Cake recipes appeared in commercial cookery books. These books promoted cooking appliances or a food-related product. Promotional books copied recipe innovations that had already become familiar within the community (Leach and Inglis 2006: 68). In 1952 a nutless Ladysmith Cake version appeared in the *Edmonds Sure to Rise Cookery Book* (seventh edition, reprint) (Raphael 2021). With four eggs, the recipe made a rather large cake. The inclusion of custard powder is also unique:

Ladysmith Cake

½ lb. Butter

1 heaped tablespoon Edmonds Custard Powder

½ lb. Sugar

2 level teaspoons Edmonds Baking Powder

4 Eggs

½ lb. Flour

1 heaped tablespoon Cornflour

Cream butter and sugar, add well beaten eggs alternately with sifted dry ingredients. Take less than half the mixture and add 4 level teaspoons cinnamon and 2 extra tablespoons flour. Place in greased tin, spread with a little raspberry jam. Put remainder mixture on top. Bake in greased tin about 1 ½ hours (400°F).

The seventh *Edmonds* differed from the sixth edition (*New Zealand Herald* 1936) and featured recipes now embedded in national consciousness: Anzac Biscuits and Pavlova; with Khaki Cake and Lamingtons added to subsequent "de luxe" editions (Fig. 6). The deluxe *Edmonds* Ladysmith Cake recipe differed to the seventh edition: the number of eggs was reduced, custard powder removed and nuts added. From the 1950s a number of recipes included instructions to sprinkle the top with chopped nuts, usually walnuts, before baking.

With each decade the new electric cooking technology became more efficient. Another theme that emerged from necessity during the 1930s depression, followed by war time restrictions in the 1940s and early 1950s, was an economy of ingredients. The ethos of making do continued into the 1960s. For example, Marion McCrostie's *Atlas Cookery Book* (eleventh edition, 1965) economical Ladysmith Cake recipe took just two eggs (Fig. 7). However, compared to the brief instructions found in the *Southbridge Women's Institute Cookery Book*, McCrostie included important details about the size of tin (6 x 8 inch), cooking time (30 to 40 minutes), and temperature (350° F). The recipe was easy to follow and used British imperial measurements, "4 oz. each of butter, sugar and flour" (McCrostie 1965: 48). The main purpose of this cookery book was to promote the latest Atlas electric stove. McCrostie, who trained as a teacher, worked for the MED and got involved in community festivals as part of Canterbury College's adult education outreach to rural communities. McCrostie's role was to conduct an afternoon cookery programme (*Press*, 10 June 1950: 6).

Just one Mafeking Cake recipe was found in the New Zealand-published cookery books in Canterbury Museum's collection, suggesting a briefer transmission period than the idea of the Ladysmith Cake recipe. Cookery books published c. 1930–1970s did not include any connection between the Ladysmith Cake (or Khaki Cake) recipe and the South African War, but online recipes do. Did Veart (2008) influence the revival of the recipe amongst food bloggers such as New Zealand's

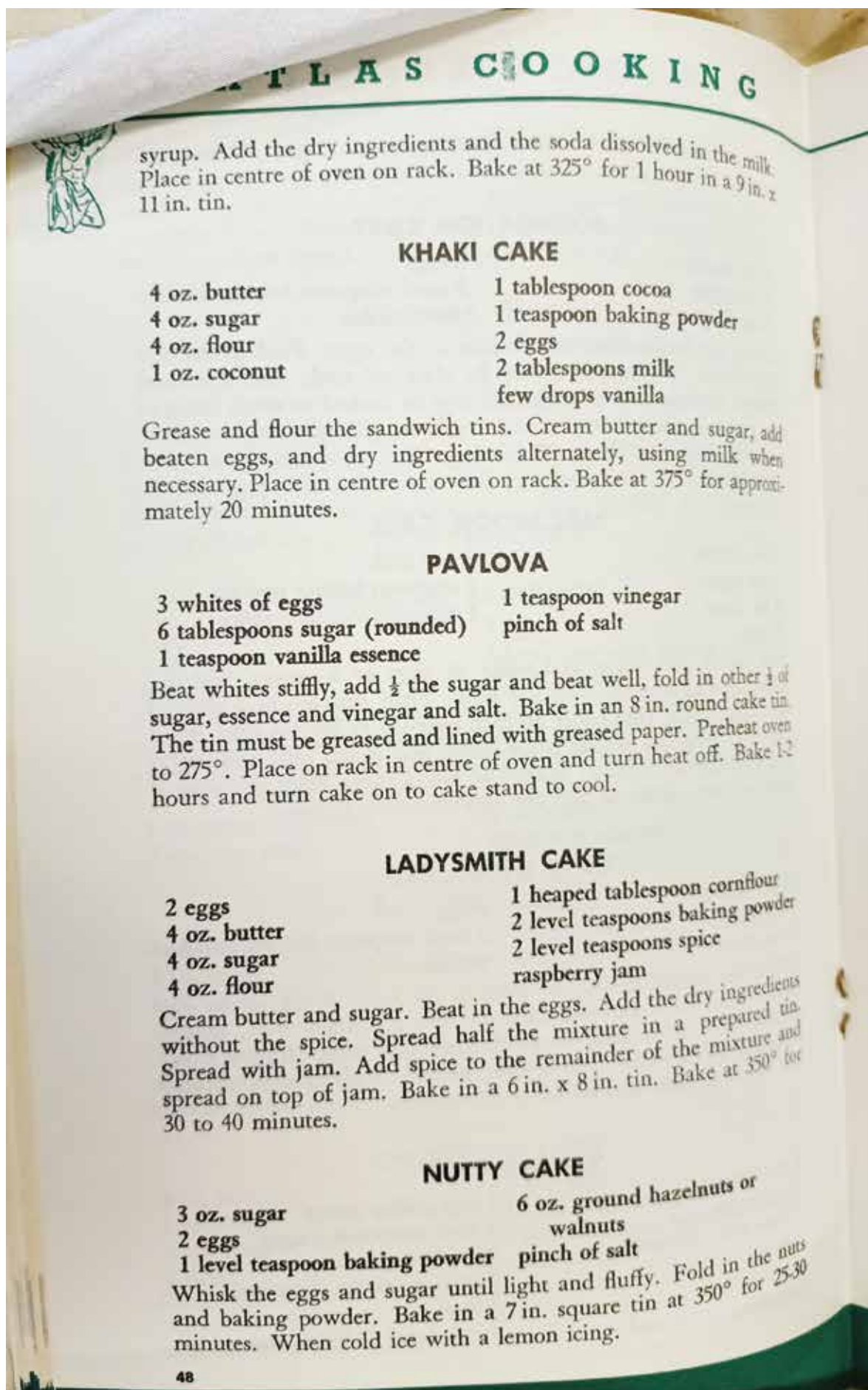


Figure 7. Marion McCrostie's very economical Ladysmith Cake recipe. *Atlas Cookery Book* (eleventh edition, 1965: 48). Canterbury Museum 2008.22.3 Booklets & Manuscripts

Linno Yum (2010) and Welsh-based The Procrastobaker (2011)? If so, food historians have an obligation to add further fresh insights into the recipe's folklore, such as making more explicit the cultural politics behind the recipe, such as how its method and ingredients have deep connections to the British Empire. Furthermore, as an edible war memorial, the idea of the Ladysmith Cake recipe makes an effective teaching tool. Food evokes the senses and the rituals associated with making, sharing and eating Ladysmith Cake (or any other South African War confection) can invite discussion about national foods and their role in collective memory.

What is Ladysmith Cake?

In the global history of cake baking, Ladysmith is a light batter cake, made in the British (Davidson 2014: 128–130) or Anglo-American cooking tradition (Weaver 2003: 288–292). It took a while for cake to find its place. In the later eighteenth century to early nineteenth century, cakes like Madeira were considered luxury incidental foods, eaten by the social elite and taken with sweet wine or tea (Davidson 2014). By the 1900s, cake baking was more widespread.

The method and order of ingredients matters. To make Ladysmith Cake beat butter and sugar into a cream; next beat some eggs then add alternatively with the dry ingredients cornflour, flour, and baking powder or alternate raising agent. Creaming and beating adds air to the mixture. These air bubbles augment with the heat during the baking process (Davidson 2014). Ladysmith Cake is made of two different coloured batters, which make it similar to Anglo-American Marble Cake – but different. Rather than stir the mixture into each other just before cooking to create the marble effect (Davidson 2014), the vanilla-flavoured Ladysmith Cake batter is layered on top of the spice-flavoured mixture separated by jam filling. The Ladysmith Cake recipe is distinct from the western European pastry/gateau/torte tradition. In addition, modern Ladysmith Cake recipes show a preference for walnuts rather than pecans, which supports the argument there is little evidence of North American influences in this regionally distinct dish. Another cultural factor is how the Ladysmith Cake recipe used everyday ingredients readily available from grocers, merchants and growers. In the early decades of the 1900s New Zealand householders experienced ongoing increased costs (Royal Commission on Cost of Living in New Zealand 1912) therefore, in order for a regional confection to take hold, it needed to fit the budget and fill the stomach.

Some Bite-sized Conclusions

The origin of the Ladysmith Cake recipe is somewhat unclear, which is part of the allure. As collective memory objects, eponymous recipes like Ladysmith gained popularity in New Zealand during the interwar

period when regionally distinct foods formed ideas of a national identity, national diets and national foods. These culinary innovations occurred in conjunction with more reliable, modern cooking technology whether New Zealand made or imported. At this time Kiwi home baking needed to be inexpensive, contain some nutrients and satisfy the appetite, and New Zealand's South African War experience gave rise to a number of new recipes in the Anglo-cake tradition with patriotic titles so that they could be remembered.

The recent 120th commemoration of the South African War produced an opportunity to review the long-term impact of the war (e.g. McFadden 2020; Spiers 2020; van Heyningen 2020). While much ink has been dedicated to the idea of the Anzac Biscuit recipe and its connection to World War One, less is known about other commemorative national foods that developed during the same era. A recipe for Anzac Crisps first appeared in 1918, however Khaki, Ladysmith and Mafeking Cake recipes that memorialise New Zealand's South African War experience and demonstrate loyalty to the British Empire were also in circulation and part of this wider national food movement that peaked in the inter-war era. These recipes promoted local, regional ingredients (Holtzman 2006; Ferguson 2010). The "South African war experience set the pattern for New Zealand's later involvement" in other world wars (Crawford 2000), not just from a military history but also from a food history perspective.

The Mafeking Cake recipe, like Seddon Cake, has just about disappeared from cultural memory and the possible link between Khaki Cake and the war is quite hard to prove; yet Ladysmith Cake has endured in national memory as an edible war memorial. As a collective memory object, the recipe has been of service to national identity, with adaptations each generation. While the Ladysmith Cake recipe historical record is fragmented, ephemeral and incomplete, dark heritage provides a useful framework to study eponymous recipes as sites for resistance and renewal.

How could the Ladysmith Cake be considered part of dark heritage? As Amir Amirani explained, dark heritage opens a window onto "alternative" and "hidden histories" (in Burke et al. 2021: v). I argue that this continuing evolution of the idea of the Ladysmith Cake recipe and its folklore can help reconcile the collective trauma experienced by those on the battlefield, under siege, in the concentration camps during the South African War. However, this is only possible if that memory draws in a localised form of restorative heritage praxis. Rethinking about the past can help us understand what happened and why. In South Africa for example, the theme of "not forgetting" shapes Boer women concentration camp testimonies (van Heyningen 2020: 9) reproduced at heritage sites and in history texts. The additional fact that the concentration

camp conditions were even worse for the Black Africans enriches the tragic connection with the folklore of the Ladysmith Cake recipe and heightens its function as a tool for remembering conflict.

How has the evolution of the recipe been a form of resistance or renewal (or how could it)? As an edible war memorial, the rituals associated with making, sharing and eating Ladysmith Cake (or any other South African War confection) can foster conversations about war in relation to conciliation, disarmament and peace. Another factor to reconcile concerns the intersections between race, class and gender. With New Zealand's racial policy geared towards amalgamation, the Crown had no interest in an equal power-sharing relationship with Māori who offered to serve as a unit. Yet as a form of simultaneous protest and support for the war effort, Māori still engaged and have continued to support later offshore military operatives (Webb 2018). These uncomfortable complexities need to be remembered. Another hidden chapter in history concerns the relationship between gender and baking commemorative foods (Cedro 2019). Further investigation into the recipe's transmission and the war using a masculinity, queer and transgender lens is also required.

It is time for journalists, food influencers, historians and individual members of the community to move beyond the Anzac Biscuit and rediscover the complexity of the origins of the Ladysmith Cake recipe and the other South Africa War confections (which aren't really known). To get you started, use the reference to Ladysmith to link the cake recipe to uncover other hidden, often difficult histories. Maybe a thin slice of cake served with a cup of tea or coffee or a small glass of sweet wine can help.

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The pre-European Use of Lithic Materials in the Canterbury Region, New Zealand

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Former Māori inhabitants of the Canterbury region, in the South Island of New Zealand, had access to a variety of stone (lithic) materials for utilitarian tools such as adzes, chisels, drill points and cutting implements, as well as for ornaments and items employed in fishing. More than 20 different rock types have been identified among artefact collections from the region, though only about half of these were widely utilised. Some were imported, either as finished artefacts or raw materials, from the north (Nelson-Marlborough and North Island), south (Otago-Southland) and west (West Coast/Westland), but others were obtained within Canterbury. These include greywacke, basalt, silcrete, chert, chalcedony, silicified tuff, sandstone and red argillite.

This study involved the examination of more than 6,700 Māori artefacts from 11 key archaeological sites in Canterbury. New information was obtained on the composition, distribution and sources of some of the lithic materials utilised at both Early (fourteenth to sixteenth century) and Late (sixteenth to eighteenth century) period sites in the region. The data also reveals some important intra-regional variations and temporal changes in the use of certain materials, including a significant decline in silcrete during the Late period (post-sixteenth century) and a corresponding increase in the use of chert and chalcedony. The presence of a few distinctive minor lithologies at multiple sites indicates there was probably a considerable degree of interaction between many of the early communities situated along the Canterbury coast.

Keywords: archaeological sites, Canterbury, lithic materials, Māori artefacts, stone sources, taonga

Introduction

The Canterbury Lithics Project was initiated in 2017 in order to provide an overview of the pre-European utilisation of kōhatu (stone materials) in the Canterbury region. Although a useful review of existing information had already been published (Challis 1995), it was considered important to obtain some new data on the various lithic materials previously used by Māori, with an emphasis on those found within Canterbury. There were two specific objectives: (1) to better document known or suspected pre-European stone sources and obtain new information on the attributes of the rock; and (2) re-examine existing artefact collections at Canterbury Museum (and other museums where appropriate) to provide more reliable identifications of rock types, establish their provenance, and determine any regional variations in the use of particular materials. The first objective has been largely met through the publication of separate papers (Moore and Trotter 2017; Moore 2019; Moore and Davis 2020; Moore et al. 2020). The second is the main focus of this paper.

The study involved the examination of more than 6,700 Māori artefacts (taonga) from 11 key archaeological sites, most of which are located along the coast. The majority of these sites date to the Early or Mōa-hunter period (fourteenth to sixteenth century) of New Zealand prehistory, but a few were occupied during the Late or Classic Māori period from the sixteenth to eighteenth century (Davidson 1984; Challis 1995). Most of the artefact collections from these sites are held by Canterbury Museum. Some were also examined at South Canterbury Museum (Timaru) and Otago Museum (Dunedin).

Study Area and Archaeological Sites

For the purposes of this study the Canterbury region is taken as that area between Claverley in the north and the Waitaki River in the south (Fig. 1). In contrast to Environment Canterbury boundaries this excludes the entire Kaikōura District and most of the Waitaki District but is similar in extent to the Department of Conservation's Canterbury Conservancy region (Challis 1995). Mid Canterbury is regarded here as the area between the Waimakariri River and Rangitata River, including Banks Peninsula.

The locations of archaeological sites from which artefact assemblages were examined are shown on Figure 1. In general, only those sites containing significant numbers of artefacts were considered in this study. Site numbers (e.g. M36/24) are those of the New Zealand Archaeological Association Site Recording Scheme, ArchSite (www.archsite.org.nz).

Previous Work

There has been a long-standing interest in Māori stone artefacts in Canterbury which began, formally, with Julius von Haast (1871). As Provincial Geologist, he made a particular note of some of the rock types used at the expansive Rakaia River mouth site, including silcrete, palla (silicified tuff) and flint. Later, he also recorded the range of stone items recovered during excavations at Mōa-bone Point Cave and the adjacent dunes at Redcliffs (Haast 1874).

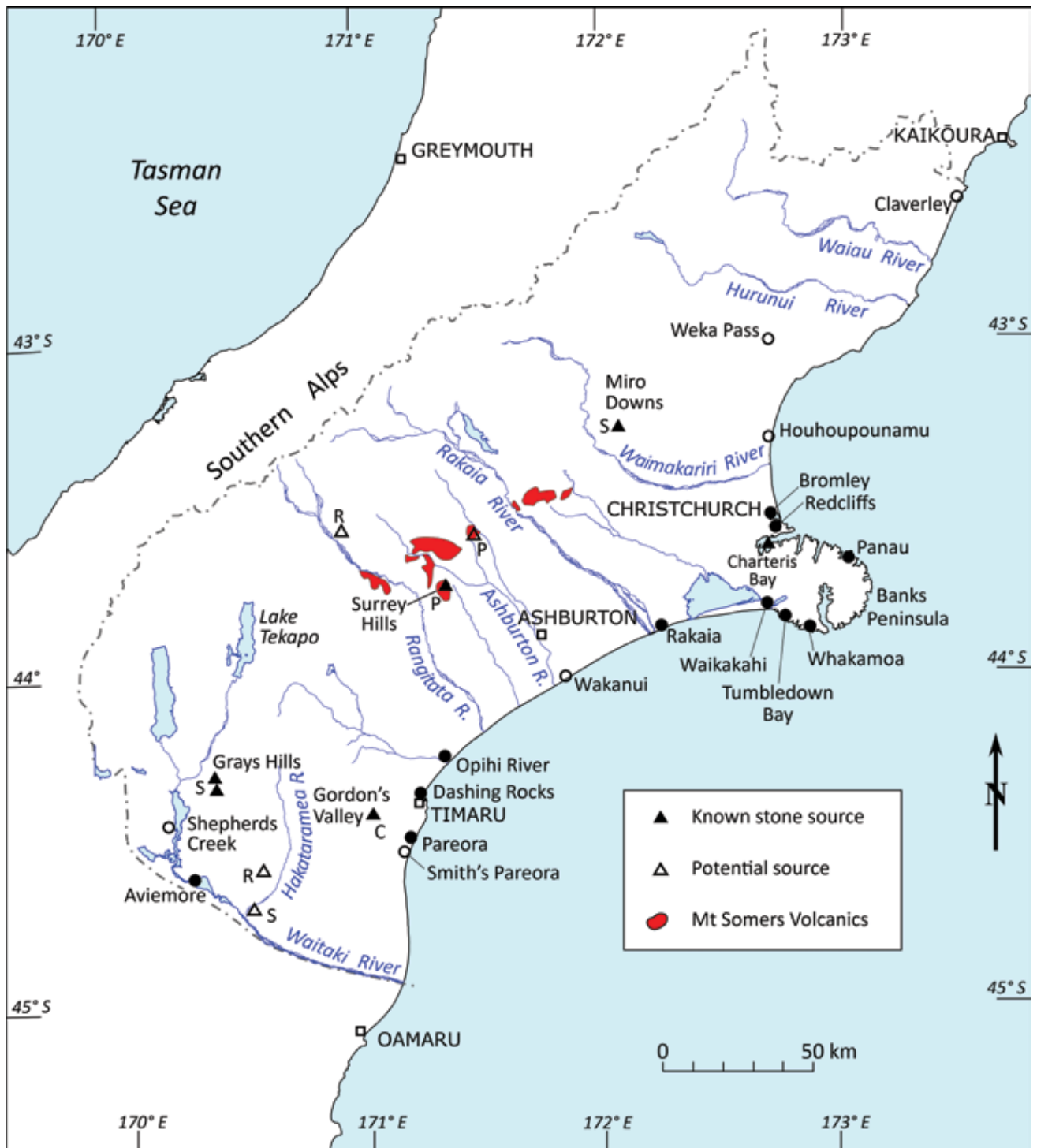


Figure 1. Map of the Canterbury region, showing the location of archaeological sites (black dots = main sites, open circles = other sites) and known and potential stone sources. Letter codes associated with stone sources are: C = chert, P = porcellanite/palla, R = red argillite, S = silcrete

No comprehensive lithologic study of artefacts from the Canterbury region has been previously carried out, but an important petrological paper on pounamu (nephrite and bowenite) artefacts from Otago and South Canterbury was published by Turner (1935). Further petrographic work was undertaken by Simmons and Wright (1967) on silcretes from various South Island sites, including the Grays Hills quarry in the Mackenzie Basin. Some brief notes were also provided by Dawson and Yaldwyn (1975) in an account of their small-scale excavations at Redcliffs in the 1940s (see Trotter 1975).

As part of his monumental PhD thesis, Orchiston (1974) documented the occurrence of a range of artefacts made from such materials as palla, porcellanite, red argillite and greywacke, though he did not undertake any petrographic study of these rock types. Only one paper – on palla – was published (Orchiston 1976). In a later study, Jacomb (1995) carried out an analysis of artefact assemblages from 15 sites between Wairau Bar in Marlborough and the Rakaia River in mid Canterbury. Adzes were classified according to Duff's (1956) typology, but simply divided into greenstone (nephrite) and non-greenstone. Some additional information was provided by Jacomb (2000, table 1).

Chemical analysis has been previously restricted to small numbers of obsidian flakes from selected Canterbury sites (Seelenfreund and Bollong 1989), including an assemblage of obsidian and what was thought to be pitchstone from the Wakanui site (K38/3) near Ashburton (Mosley and McCoy 2010). Both studies employed non-destructive X-ray fluorescence (XRF) spectroscopy.

Methods

In the present study many artefacts were examined under a binocular microscope in order to establish the grain size of sedimentary rocks (using a standard grain size comparator), composition, texture and, in a few cases, fossil content. Colours were based on the internationally recognised Munsell Soil Color Chart (2000 version). A small magnet also proved useful, particularly in distinguishing basalt from some similar-looking non-magnetic rock types such as black metasomatised argillite and fine-grained greywacke. Additionally, some materials were subjected to non-destructive geochemical analysis using portable XRF (pXRF).

While an effort was made to examine complete collections from a range of archaeological sites (both geographically and in terms of their age), in many cases only artefacts of certain lithology or type were closely studied. For example, finished adzes were generally excluded, and items made of pounamu (nephrite), meta-argillite and greywacke were not always recorded. Greater emphasis was also placed on the analysis of flake

material, particularly of rock types which had received little attention in the past (e.g. chert). Collections from some areally extensive sites, like Redcliffs and Rakaia, were only partially examined. That from the Late period site of Houhoupounamu was not included because of the very large size of the assemblage (>4800 items, Challis 1995: 38) and the need for more detailed analysis of the artefact material. Small collections were examined from a few other sites such as Claverley, Weka Pass (Moore in prep a), Connolly's Seadown (near Temuka) and Shepherds Creek (Moore in prep b; Fig. 1).

Catalogue numbers (e.g. E154, 2008.1005.1) referred to here are those of the Canterbury Museum, unless otherwise stated. Artefacts held by South Canterbury Museum and Otago Museum are prefixed SCM and OM respectively.

Lithic Materials

The more significant lithic materials recorded from Canterbury sites are listed in Table 1. They are divided into those that were definitely imported, and those that are considered to be at least partly of local (Canterbury) origin, like chert and silcrete, based on existing geological and archaeological knowledge. Of the local materials, new information was obtained on the visual attributes, sources or archaeological distribution of basalt, silcrete, sandstone, chert, chalcedony, red argillite, palla, Panau flint, and pitchstone. In total, more than 23 different rock types have been identified. Māori names for some of these are recorded where known.

Table 1. More significant lithic materials utilised at Canterbury sites.

Local rock types	Imported (source)
Basalt	Meta-argillite (pakohe)* Nelson-Marlborough
Silcrete	Pounamu# (nephrite and bowenite) Westland, Otago
Chert	Obsidian (mataa) – North Island
Chalcedony	Porcellanite – Otago-Southland
Pitchstone	Silcrete – Otago
Panau flint	Chert – Kaikōura area
Palla (silicified tuff)	
Red argillite	
Sandstone	
Greywacke	

* An abbreviation of metasomatised argillite

Pounamu is the Māori name for both nephrite and bowenite (Beck 1984). Some was apparently procured from the Wakatipu area (western Otago), and possibly Fiordland.

Meta-argillite (Pakohe)

This is a particularly hard and tough, but readily flaked, fine-grained metamorphic (metasomatised) rock, well suited to the manufacture of adzes and chisels (Johnston 2011). It is referred to simply as argillite or indurated mudstone in earlier reports. The bulk of the meta-argillite used at Canterbury sites undoubtedly originated from quarries in the Nelson-Marlborough region. It is mostly grey, dark grey or black, but some is light grey with black veins, typical of material from the Ohana quarry on D'Urville Island (Keyes 1979). A few flakes and other items of greenish grey argillite were also recorded at some sites (e.g. Rakaia, Dashing Rocks), which may originate from Southland (Jennings 2009).

Basalt

The question of where the basalt used to manufacture local adzes came from, such as those found at Redcliffs, has been a long-standing problem in Canterbury archaeology. Although the prevailing opinion is that the basalt was procured from Banks Peninsula (e.g. Trotter 1975; Challis 1995), in the absence of any recorded Māori quarries or dedicated stone-working areas this has remained unproven. Doubts were also raised by the

petrological study of a single basalt flake from Redcliffs, which suggested the most likely source was somewhere in East Otago, possibly Dunedin (Dawson and Yaldwyn 1975).

In 1990, however, apparent evidence of stone-working was recorded at nine sites along the eastern side of Lake Forsyth (Challis 1995). Given the importance of this discovery the area was re-visited in 2017, but it was evident that what was thought to be flaking visible on scattered basalt boulders in this area had been caused by natural impacts as a result of rolling down the steep hillside, or being hit by other falling rocks, not by pre-European Māori. No adze preforms, concentrations of stone flakes or hammer-stones were found in the vicinity.

In March 2018 a project was initiated to try and establish the source(s) of basalt used in the manufacture of adzes found on Banks Peninsula and surrounding area by employing non-destructive pXRF analysis. Unfortunately, no definite source was able to be identified.

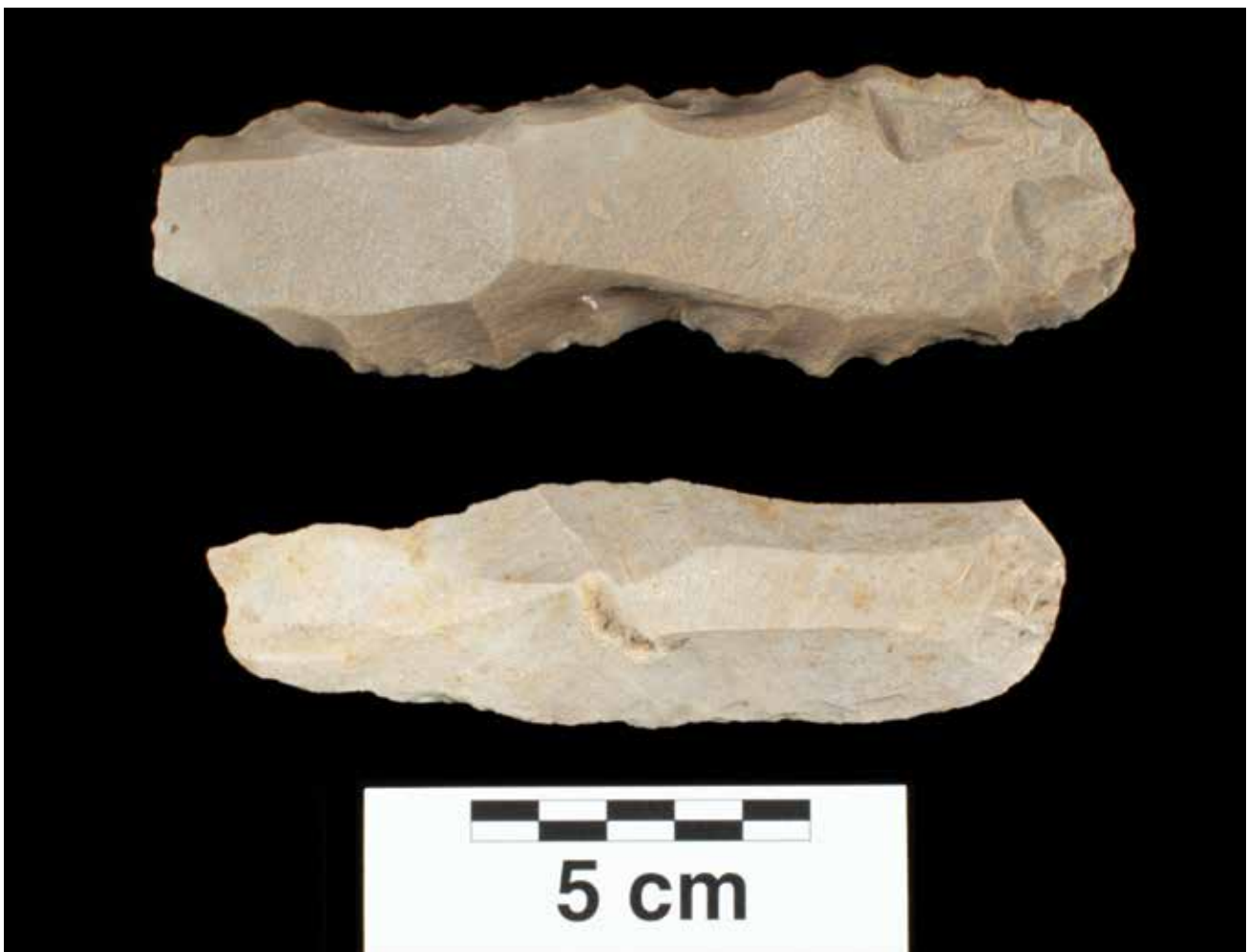


Figure 2. Silcrete blades from Rakaia (top, E70.57) and Bromley (bottom, E155.81). Canterbury Museum collection

Silcrete

Also referred to as quartzite or orthoquartzite, silcrete is a hard, silica-cemented sandstone. Much of it was probably imported from Otago, where there are a number of significant quarries (Hamel 2001; Anderson 2003), but two primary sources are also known in Canterbury: Grays Hills in the Mackenzie Basin, and Miro Downs near Oxford (Fig. 1). More detailed accounts of these sources are provided by Moore and Davis (2020) and Moore et al. (2020).

An occurrence of detrital (alluvial) silcrete has also recently been recorded by the author in the lower Hakataramea Valley, South Canterbury, consisting of sparse cobbles and rare boulders in the Hakataramea River and some tributaries (Fig. 1). The silcrete is of moderate to poor quality, varies from white to grey, is fine to medium grained and moderately sorted. Many samples also include patches, layers or clasts of white clayey material. Harder pieces have a sub-conchoidal fracture.

Artefacts of silcrete are common at many early sites along the Canterbury coast, such as Bromley, Redcliffs, Rakaia, Dashing Rocks and Pareora, where it seems to have been used mainly as a cutting implement (Fig. 2). It was also used for drill points. The stone varies in colour from white to grey to yellowish brown, and generally has a similar grain size, though some material from the Pareora site J39/29 is unusually coarse grained (e.g. OM D67.4063). A few artefacts from some sites (e.g. Opihi River) have remnants of smooth, water-worn cortex, indicating they were derived from river or beach cobbles. However, without detailed petrographic study and/or geochemical analysis it would be very difficult to establish exactly where the silcrete originated from.

Porcellanite

Porcellanite (also spelled porcelanite) is defined as a dense siliceous rock with a texture, hardness and dull lustre similar to that of unglazed porcelain (www.mindat.org), and can be of sedimentary, volcanic or metamorphic origin. It generally refers to a siliceous shale or impure chert, but the term is also applied to fine-grained tuff cemented by silica (e.g. palla), hard baked clay or shale associated with burned-out coal seams and sedimentary rocks melted by volcanic eruptions. In Canterbury, some porcellanite artefacts appear to have been previously classified as jasper or jasperoid (e.g. Mason and Wilkes 1963a; Trotter 1972). The latter is a cherty rock formed by the replacement of calcite or dolomite by silica (i.e. silicified limestone), and not an appropriate term.

An unstated number of porcellanite artefacts, of variable colour, were recorded by Orchiston (1974) from eight sites along the Canterbury coast between Banks

Peninsula and the Waitaki River. He considered all of the porcellanite had come from known sources in Otago and Southland (e.g. Anderson 2003; Gillespie 2020), where it was formed by the baking of clay or shale by natural burning of coal seams. Artefacts of this material are relatively common at Rakaia, and also occur at Pareora, Lake Aviemore and in the Mackenzie Basin (Moore in prep b). Colours recorded from these sites include grey, bluish grey, reddish grey (2.5YR 7/1, 10R 6/1), reddish brown (5YR 3/2), brown and yellow-brown. Some of the yellowish material looks remarkably similar to chert (jasper).

At least one geological occurrence of porcellanite is known in Canterbury. This is an isolated deposit of what appears to be baked siliceous tuff at Mt Alford, which has been formally recorded as a pre-European quarry (site K36/2). However, the extent of flake quality material is small (pers. obs.), and it is doubtful that many artefacts could have been produced. A chemical analysis of the rock is presented in Moore and Trotter (2017). Another occurrence was reported by Speight (1928) at Burnt Hill near Oxford. This locality was re-visited in 2018 to see whether the porcellanite was of sufficient quality to have been utilised by early Māori, but none could be found. Both of these occurrences, therefore, can probably be ruled out as a source of the porcellanite artefacts found in Canterbury sites, particularly those in South Canterbury.

Two flakes of white porcellanite (2008.1009.2503) were recorded from Tumbledown Bay, site N37/12 (see also Mason and Wilkes 1963a: 99). These do not fall within the colour range of Otago-Southland porcellanites reported by Orchiston (1974) and may originate from one of the silcrete sources in Canterbury, possibly Grays Hills. Three other flakes from Tumbledown Bay that had been previously labelled “?porcellanite” (E163.228D, 234H, I) were identified as yellowish brown chert. These may be the items recorded by Orchiston (1974).

Palla

One of the more colourful rock types found in Canterbury is a distinctive green silicified tuff termed palla, which can be regarded as a variety of porcellanite. Its use for adzes by early Māori was initially recognised by Haast (1871) and later documented by Orchiston (1974, 1976). A more complete account of the occurrence, composition and utilisation of this material has recently been published (Moore and Trotter 2017). The only known source of palla is at Surrey Hills (Gawler Downs), west of Mt Somers (Fig. 1).

Since 2017 some additional artefacts of palla have been recorded, from Bromley (43 flakes and pieces), Redcliffs (2 flakes, part of preform adze, drill point), Tumbledown Bay (5 flakes) and Rakaia (10 flakes and pieces). These new records do not extend the known archaeological

limits of this rock type (Moore and Trotter 2017, fig. 4), but do indicate greater use of palla at Bromley, and establish its use at Tumbledown Bay. One flake possibly of palla (SCM, E444) has also been recorded from Milford in South Canterbury, a locality previously noted by Orchiston (1974).

Chert

Artefacts of chert (or flint) have been recorded at many Canterbury sites, but the lack of any consistency in terminology or description of the material in previous reports has made it difficult to establish, with any certainty, where it originated from or how many sources may be represented. The terms chert, flint and jasper have all been used at various times.

It has been previously recommended that a broad definition of chert be adopted to include highly siliceous rocks of different origins (i.e. sedimentary and volcanic) and modes of occurrence, and that use of the term flint be abandoned (Moore 1977). However, it is probably reasonable to assume that in most cases the flint recorded in reports on Canterbury sites (e.g. Jacomb 2000) generally refers to chert derived from the Mead Hill Formation and/or Amuri Limestone in the Kaikōura area, and therefore constitutes an imported lithic material. It is referred to here as Kaikōura

chert (Moore 2021a). Other forms of chert, variously described as jasper or jasperoid rock (e.g. Parry 1960; Mason and Wilkes 1963a; Trotter 1972) are likely to be of local origin.

Most of what was considered in this study to be Kaikōura chert is grey, though some is white, pale brown or black. It is also characterised by the presence of tiny microfossils (primarily radiolaria and foraminifera), as well as bioturbation (fossil burrows, Fig. 3). In contrast, local chert (or jasper) is typically red-brown to yellow-brown, and in some cases brown or green. In addition, it has a distinctive moss-like texture and often contains veins of chalcedony (Fig. 4). Some difficulty was experienced in deciding upon the likely source of white chert, and it seems that such material may have come from both Kaikōura and local sources. At least two flakes of white chert from Redcliffs contained microfossils, indicative of a sedimentary (marine) origin.

The probable source for much of the local chert is the Mt Somers Volcanics, which outcrop discontinuously along the Canterbury foothills between the Malvern Hills and Rangitata Gorge (Cox and Barrell 2007; Fig. 1). Most archaeological material could have been obtained from rivers draining the various areas of these volcanics, particularly the Hororata, Ashburton, Hinds and Rangitata, or from gravel beaches along the



Figure 3. Core of Kaikōura chert, with well-preserved bioturbation (compressed burrows), Rakaia. Canterbury Museum 19xx.1.2470
Photo by author.

coast. Some of the cores and flakes of local chert from the Opihi River site K38/11 contain remnants of water-worn cortex.

Gordons Valley Chert

A different, rather distinctive type of chert has been identified in the Pareora area (Moore 2019). It occurs in situ in the form of nodules and irregular masses within limestone at several localities around Gordons Valley, including some rock shelters (Fig. 1). Use of this material, which is only of moderate quality, seems to have been mainly restricted to the Gordons Valley-Pareora area. It is relatively common at the Pareora site J39/29.

Pahautane Chert (Heaphyite)

This chert, which has also been referred to as heaphyite (Wilkes and Scarlett 1967), occurs on the West Coast near Punakaiki, and also at Karamea (pers. obs.). It is very similar in appearance to Gordon's Valley material. Four flakes of what are considered to be Pahautane chert were identified from Redcliffs (2008.1108.8, 78), along with a core from Sumner (E167.545) and another from Weka Pass (Moore in prep a). The cores and at least two of the flakes contain common sponge spicules, a feature of both the Pahautane and Gordon's Valley chert.

Black Speckled Chert

A total of 15 flakes and pieces and three cores of this previously unrecognised rock type were recorded, from four different sites (Rakaia, Dashing Rocks, Pareora and Aviemore). It is most common at Rakaia (Fig. 5). The rock is typically dark to very dark grey, has an unusual speckled texture, and contains abundant white platy crystals (up to 0.5 mm across), sand-sized quartz grains and rare mica. The white crystals, which may be feldspar, are randomly oriented. Some artefacts also include white blotches (in two cases with small quartz crystals) and veins of chalcedony. Although the rock does not contain any obvious organic material, a few pieces show what appear to be bioturbation and thus it may have a sedimentary origin. It could be a silicified tuff and, if so, possibly came from the Mt Somers Volcanics.

Chalcedony

This cryptocrystalline variety of quartz (which includes agate and carnelian) was utilised at many sites along the Canterbury coast, and is assumed to be of local origin. It appears to have been used, like chert, mainly for cutting and scraping purposes, although one possible drill point was recorded from Tumbledown Bay, and several others from Connolly's Seadown (site K38/13) north of Timaru. There is also a round cobble, used as a hammer-stone, from Redcliffs (E142.277). Some small cores and flakes



Figure 4. Core of local chert, Temuka. South Canterbury Museum no. 433. Photo by author



Figure 5. Flake of black speckled chert, Rakaia. Photo by author. Canterbury Museum E167.95

from the Opihi River site have remnants of water-worn cortex, indicating the chalcedony was obtained from a river or beach environment. One core of carnelian from Whakamoia (site N37/14) has a rough cortex suggesting procurement from close to the primary source.

Most chalcedony probably originated from the Mt Somers Volcanics, where it occurs mainly in the form of nodules or veins (as agate) within the Barossa Andesite and Hinds River Dacite (Oliver and Keene 1989). Significant quantities of agate have been collected for lapidary purposes from the Malvern Hills, Mt Somers, Clent Hills, Upper Hinds River and near the Rangitata Gorge, as well as from other rivers and parts of the coast (Luxton 2015). A minor occurrence of agate has also been recorded at McQueens Valley on Banks Peninsula in an old andesite quarry (Speight 1935; Luxton 2015) but this may not have been exposed in pre-European times.

Other Silica Varieties

Other silica minerals or varieties recorded in some artefact assemblages include common opal (sometimes referred to as opalite), petrified wood and quartz. A few flakes and pieces of common opal (or opaline chert) were recorded at Rakaia, the Opihi River and Dashing Rocks. Most of it is white, but two pieces of bright green material were identified from Rakaia. The opal is brittle and generally very fractured, and unlikely to have been easily worked. It probably originated from the Mt Somers Volcanics.

Only a few flakes of petrified (silicified) wood were recorded, from Rakaia (n=1), Dashing Rocks (n=2?) and Pareora (n=2). Potential sources of this material include the Waitaki River and various rivers draining the Mt Somers Volcanics, notably the Hororata, Ashburton and Rangitata. It is also found along the coast, particularly at Birdlings Flat.

Quartz veins have been recorded from the Gebbies Pass area (Speight 1935) and quartz (including amethyst) is

also found in the inland Mt Somers Volcanics. It rarely occurs in archaeological sites.

Pitchstone

This is defined as a dense, generally black, glassy material with a dull, resinous lustre and irregular to conchoidal fracture, similar to obsidian but with a higher water content of around 3–10%. While pitchstones are usually rhyolitic in composition, some are dacitic or andesitic (Preston et al.1988).

In 2010 a small number of flakes (n=12) of what was thought to be pitchstone from the Wakanui site (S103/1, now K38/3) near Ashburton, were analysed by Mosley and McCoy (2010) using a portable XRF at the University of Otago. Although no specific source could be identified they ruled out the possibility of it being from Otago Peninsula or the known occurrence of rhyolite at Gebbies Pass on Banks Peninsula (Sewell et al. 1993) and considered it probably originated from the inland Mt Somers Volcanics. Re-examination of the same 12 flakes in 2019 showed that they do not consist of pitchstone but vesicular obsidian. This is brown in transmitted light and contains vesicles up to 5 mm in diameter, as well as common to abundant white sugary inclusions of variable shape. None of the flakes have any cortex. Pitchstone previously recorded at Tumbledown Bay by Mason and Wilkes (1963a) is of the same material. Ten flakes and pieces (2008.1192.8) have also been identified from the Dashing Rocks site (K39/1) at Timaru.

To establish where the Wakanui pitchstone may have originated from, three of the flakes (2008.1005.605, 618, 655) previously analysed by Mosley and McCoy (2010), along with the single flake from Tumbledown Bay (E150.1093), were re-analysed using a pXRF instrument from the University of Canterbury. This produced very similar results to those obtained by Mosley and McCoy (2010). However, comparison with available wavelength-dispersive XRF analyses of geological samples of pitchstones from the Mt Somers Volcanics (from the Mt Somers area, Malvern Hills and Gebbies Pass) indicated

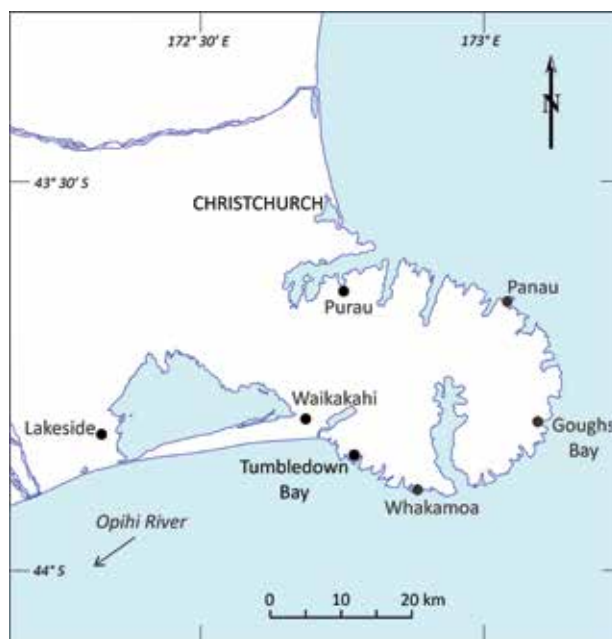


Figure 6. Distribution of Panau flint (informal name, see text)

that the Wakanui pitchstone did not originate from any of these areas. Further, there was no match with any of the known obsidian sources in the North Island. Thus, at present, the source of this material remains unknown.

Panau Flint

This term was coined by amateur archaeologists who excavated almost the entire site of Panau, a former Māori village on the northern side of Banks Peninsula (Fig. 1) between 1967 and 1975 (Jacomb 2000). It is not actually flint but a black, vitreous volcanic stone and is used here as an informal name.

Panau flint has now been identified from six different sites on Banks Peninsula – Panau, Purau, Goughs Bay, Whakamoa, Tumbledown Bay and Waikakahi (Table 2, Fig. 6). It is particularly common at Panau and Whakamoa. There is also one flake from an unknown location on Banks Peninsula, a core from Lakeside at the western end of Lake Ellesmere (Fig. 7), and one small piece from the Opihi River mouth in South Canterbury.

Table 2. Recorded artefacts of Panau flint.

Location	Number	Catalogue number	Artefact type
Panau	45	2008.1109.22, 53	flakes, cores
Purau	10	19XX.1, E159.271.2, 6	flakes, 1 core
Goughs Bay	3	E192.100-102	flakes
Whakamoa	c.60	2008.1014.1, 2	flakes
Tumbledown Bay	1	2008.1009.2339	flake
Waikakahi	5	E166.648-650	flakes, core
Banks Peninsula	1	E181.453	flake
Lakeside	1	E178.811	core
Opihi River	1	E163.167C	piece
TOTAL	127		

In hand specimen the Panau flint is black (N2) to very dark grey (N3), with a dull waxy lustre similar to that of pitchstone. Although it superficially appears relatively homogeneous, under a microscope it is seen to have a variably mottled, streaky or blotchy texture resulting from complex intermixing of black and light to medium grey, or less commonly pale to chocolate brown, glass. Many pieces also contain sparse to abundant tiny vesicles, but phenocrysts are rare. The cortex is generally rough and pitted, though four of the flakes from Panau have a definite water-worn outer surface. The rock is quite strongly magnetic, which clearly distinguishes it from obsidian, Wakanui pitchstone, and the black speckled chert. Previous thin-section petrography classified the rock as a “welded spatter”, consisting of granules of volcanic ash and basaltic spatter (Jacomb 2000: 94).

Red Argillite

A small number of artefacts made from red-brown argillite (hard mudstone) were documented by Orchiston (1974, table 2.26). Most of these had been found at early coastal sites between Banks Peninsula and Otago Peninsula and included small adzes or chisels, ‘slate’ knives, minnow shanks and some unusual carved objects. Altogether 20 items were recorded from Canterbury.

No detailed study of the artefacts made from this material has been undertaken, but those items listed by Orchiston (1974) that could be located in the Canterbury, South Canterbury and Otago Museum collections were re-examined and better documented, and several other examples added to his list (Moore 2021b). Two potential primary sources of red argillite have also been identified, at Mt Potts in the Rangitata River valley and the Hakataramea valley in South Canterbury (Fig. 1).

Sandstone

Sandstone was widely utilised for grinding and sharpening adzes, polishing ornaments, smoothing of wood and bone (e.g. fishhooks), and in some cases as a cutting implement (Best 1974), although its use has often been overlooked. The main artefact types are classified as hōanga (grinding stones), abraders and files.

Most of the abraders etc. found at archaeological sites on Banks Peninsula were thought to be composed of Charteris Bay sandstone (e.g. Allingham 1988), but this was not backed up by any description or analysis of the rock. Outcrops of Charteris Bay sandstone on Banks Peninsula are restricted to a small area around the upper part of Lyttleton Harbour, notably on King Billy Island (Aua or Little Quail), at Charteris Bay and between Head of the Bay and Governors Bay (Sewell



Figure 7. Core of Panau flint (black volcanic glass), Lakeside. Canterbury Museum E178.811

et al. 1993; Fig. 8). Māori are known to have obtained sandstone from Aua (Jackson 2006) and are also likely to have procured some material from Charteris Bay (Fig. 9).

The Charteris Bay sandstone is a white, but commonly iron-stained, moderately indurated, well sorted, quartzose fine to medium grained sandstone (grain size 0.15–0.4 mm diameter). It consists predominantly of angular to sub-rounded quartz grains in what appears to be a white clay matrix. A few quartz grains are up to 1 mm across. It also includes rare dark mineral grains, but generally no mica. None of the geological reference samples examined from King Billy Island, Charteris Bay and Orton Bradley Park contain any glauconite, though in North Canterbury the formation is glauconitic (Browne and Field 1985). Glauconite is a green silicate mineral which occurs in the form of sand-sized pellets and is generally considered to be a good indicator of marine deposition (Mortimer et al. 2011).

According to Jackson (2006: 13-14) there were two types of sandstone on Aua: coarse-grained matanui and fine-grained matarehu, with the former being considered ideal for grinding stone implements. Use of both types, though, is not supported by examination of artefact collections from Banks Peninsula, where grinding tools are composed almost exclusively of fine to medium grained sandstone. There are only a few items of fine to very fine sandstone.

Identification of the Charteris Bay sandstone in artefact assemblages was based mainly on the highly

quartzose composition, good sorting, general absence of glauconite and mica, and consistent fine to medium grain size. Some items, however, do contain sparse to common glauconite grains, particularly from Redcliffs and Paua Bay, which suggests they are either from a different geological formation or a different occurrence of the Charteris Bay sandstone. A few also contain abundant mica (e.g. 2008.1108.246, Redcliffs; E177.32 Moa-bone Point Cave) and this sandstone may well be from elsewhere.

Some of the artefacts were classified as hōanga (grinding stones). According to Best (1974) hōanga were stationary slabs of sandstone that were used primarily for grinding and sharpening adzes on. These were of various shape, with some being almost circular, and ranged upwards in size from about 25 cm across. Smaller stones may have been used to grind small implements and ornaments on, and were probably hand held. Best (1974) makes it clear, however, that such items were always rubbed on the grinding stone, not the other way around. Jacomb (2000: 81) used the term hōanga/abrader for a “piece of sandstone with at least one flat to concave worked surface, indicative of use as a grindstone or abrader”. Many pieces were considered likely to represent fragments of larger hōanga. He recorded 154 objects from Panau.

In the present study, only a few items were identified as hōanga (Table 3). One of these, from Sumner (E173.209), is deeply grooved on both sides. Another from ‘Moa Sandhills’, Redcliffs (E72.29) consists of a large slab of very fine sandstone. Many other pieces, with one

Table 3. Artefacts of Charteris Bay sandstone from the Banks Peninsula area. The number classed as abraders may be considerably underestimated. X = present.

Site	No.	Hōanga	Abraders	Files	Pieces [#]	Other [^]
Bromley	>75		>6	3	>66	
Redcliffs	235		X	>23	X	4
Moa Sandhills (Redcliffs)	3	1			1	1
Moa-bone Point Cave	2	1				1
Sumner	2	1			1	
Purau	22		1	1		
Port Levy	4		2		X	
Panau	4*		2		X	
Goughs Bay	3	1	1	1		
Paua Bay	8		7			
Sleepy Bay	1				1	
Whakamoā	13		4		8	1
Tumbledown Bay	37	1	X	1	X	
Birdlings Flat	1	1				
Kaituna	1		1			
Waikakahi	2		1		1	

*Jacomb (2000) recorded 154 items from Panau

[#] Many pieces had at least one smoothed side. They may represent broken hōanga or individual abraders

[^] Other includes possible reamers

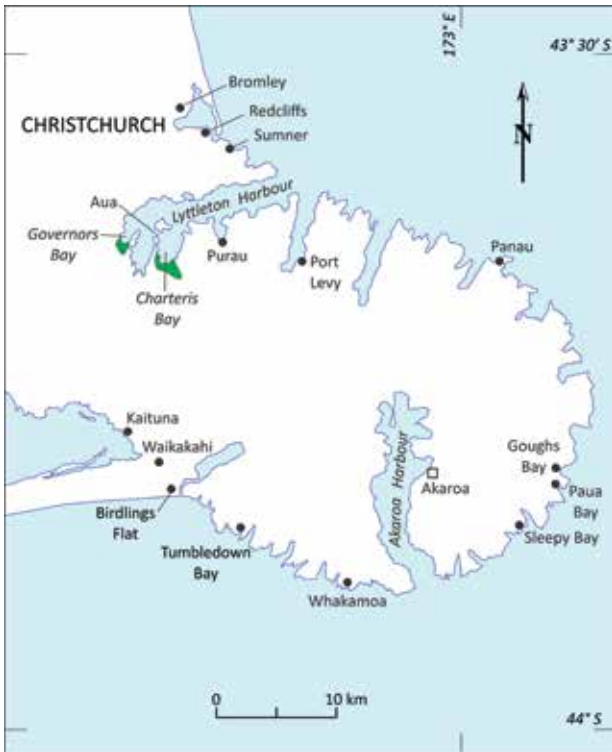


Figure 8. Distribution of Charteris Bay sandstone. Geological occurrences shown in green



Figure 10. Unusual grooved sandstone hōanga, Redcliffs. Canterbury Museum E72.98



Figure 9. Charteris Bay sandstone, Charteris Bay, 2017. Photo by author

or more smoothed surfaces, may represent fragments of larger hōanga. Those with flat surfaces might also have been used as hand-held abraders, for smoothing wood or bone. None of them showed any evidence of use to grind kokowai (red ochre). Other short pieces with a semi-cylindrical cross-section and smoothed or flattened sides were recorded as files. Some unusual items have a conical shape (e.g. Redcliffs E158.520) and may have been used as reamers to grind the interior of roughly drilled holes. Jacomb (2000, fig. 925) illustrated one such item from Panau. A high proportion of the pieces recorded from some sites appear to have been unused: of 32 pieces from Redcliffs (2008.1108.80), for example, only 3 or 4 (10%) had smoothed sides.

There is one particularly unusual hōanga from Redcliffs (E72.98), distinguished by a series of narrow, sub-parallel grooves on two sides (Fig. 10). The grooves range from 2-8.5 mm wide and are up to 5 mm deep. Some are also gently curved. This item must have been utilised for a specific purpose.

Hōanga, abraders, files and unworked pieces made of what are considered to be Charteris Bay sandstone have now been identified from at least 14 sites on and around Banks Peninsula (Table 3, Fig. 8). In total >400 pieces of this sandstone were recorded, many of which were examined under a microscope. It is particularly common at Bromley, Redcliffs and Tumbledown Bay, as well as Panau (Jacomb 2000).

Greywacke

This hard grey sandstone is the most widespread rock type found in the Canterbury region and, together with interbedded mudstone or argillite, forms much of the Southern Alps. It is the dominant material in all the major river beds and on beaches along the coast south of Banks Peninsula. However, there is little possibility of identifying a specific source for greywacke artefacts as the rock has a similar composition throughout the region (Roser and Korsch 1999).

Greywacke cobbles obtained from the rivers and beaches were an important resource for Māori, who used them to produce sharp-edged cutting and scraping tools known as teshoa (a term borrowed from North America). These were made by striking spalls or flakes off rounded cobbles (Witter 2006) and are believed to have been used mainly in cutting meat, wood and bone (Fig. 11). In later times they were also used in sawing pounamu. Mason and Wilkes (1963b) collected more than 200 spalls from an excavated area of about 38 m² at Dashing Rocks and at Normanby (site K39/3) Griffiths (1941) recorded at least 220 of them.

Small numbers of adzes were also made from greywacke, particularly during the Mid to Late period, from both grey and green greywacke (Orchiston 1974; Challis 1985), though some early adze types (e.g. Duff Type 1A from Dashing Rocks) are also known. A few other artefact types have been recorded as well, including a

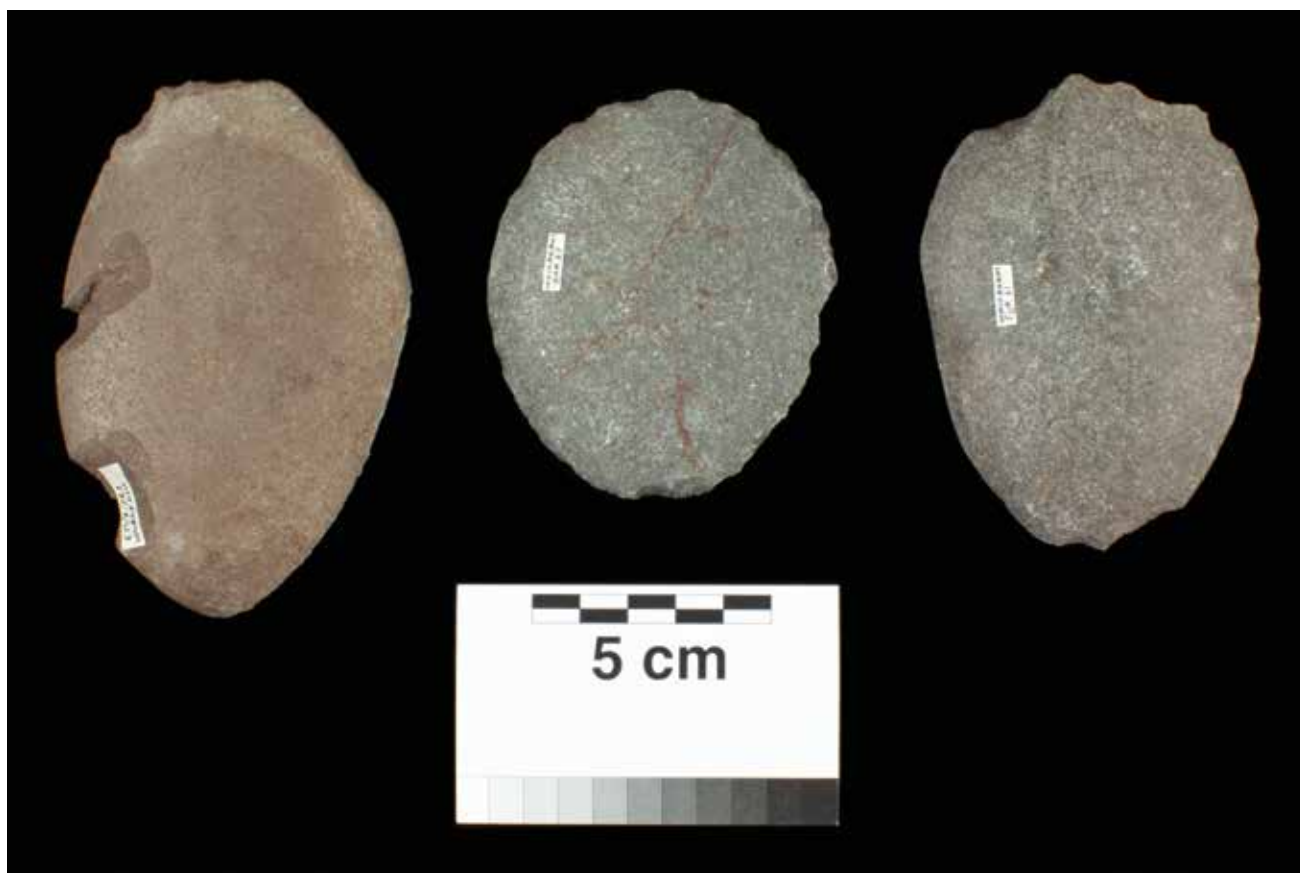


Figure 11. Greywacke teshoa, Waikakahi. Canterbury Museum E159.761, 2008.1032.13 (BAF.67 & BAF.61)

hōanga (2008.1192.25) and sinker (2008.1192.27) from Dashing Rocks.

Other

A few other rock types were recorded at some sites, including serpentine (Dashing Rocks, 1 piece) and quartzite (Waikakahi, 5 pieces). Rodingite, which is largely composed of pale green hydrogrossular garnet and pyroxene (Mortimer et al. 2011), was imported in small quantities from the Nelson area and used for hammer-stones. Granite had previously been reported from Panau (Jacomb 2000) and Tumbledown Bay (Mason and Wilkes 1963a), but none was identified in the present study and its occurrence at these sites cannot be confirmed. Schist, which was recorded from both Early (e.g. Bromley) and Late period sites (e.g. Panau), could have been obtained from larger rivers draining the Southern Alps, such as the Rangitata and Waitaki. It was presumably chosen for its abrasive qualities, for example in polishing pounamu and the manufacture of fish hooks.

Intra-regional and Temporal Variations

As well as providing information on the types of lithic materials exploited by pre-European Māori, analyses of artefact assemblages are important for making comparisons between sites and determining any spatial variations and temporal changes or trends in the use of those materials. The reliability of such analyses is very

dependent, however, on how and by whom artefacts were collected, for example whether small flakes (debitage) were retained or discarded by the excavators, or there was preferential on-site selection of particular objects, like those made from nephrite. Additionally, at very large sites like Redcliffs and Rakaia, where there was greater likelihood of spatial (and temporal) variation in activities, differences in the type and abundance of stone materials could be expected across the site. Consequently, there may be a significant bias in some artefact collections.

Quantitative data on the various lithic materials identified from 11 key sites are provided in Table 4. It is important to note, however, as mentioned under Methods, that not all artefacts of some rock types were examined; this is particularly the case for greywacke, pounamu and meta-argillite. Some artefacts were also excluded because of their very small size or condition. Nevertheless, it is evident that not only was a wide range of lithologies used at most Canterbury sites, but that the variety of imported and local rock types utilised was quite similar throughout the region. Of the imported types, pounamu was recorded at every site, and is particularly abundant at Panau (Jacomb 2000). Meta-argillite is also relatively common, particularly at larger sites. Obsidian is well-represented at some sites, notably at Bromley, but apparently rare or absent at others (e.g. Waikakahi). Although porcellanite was widely utilised in Otago (Hamel 2001), this was not the case in Canterbury and at most sites it is rare or absent.

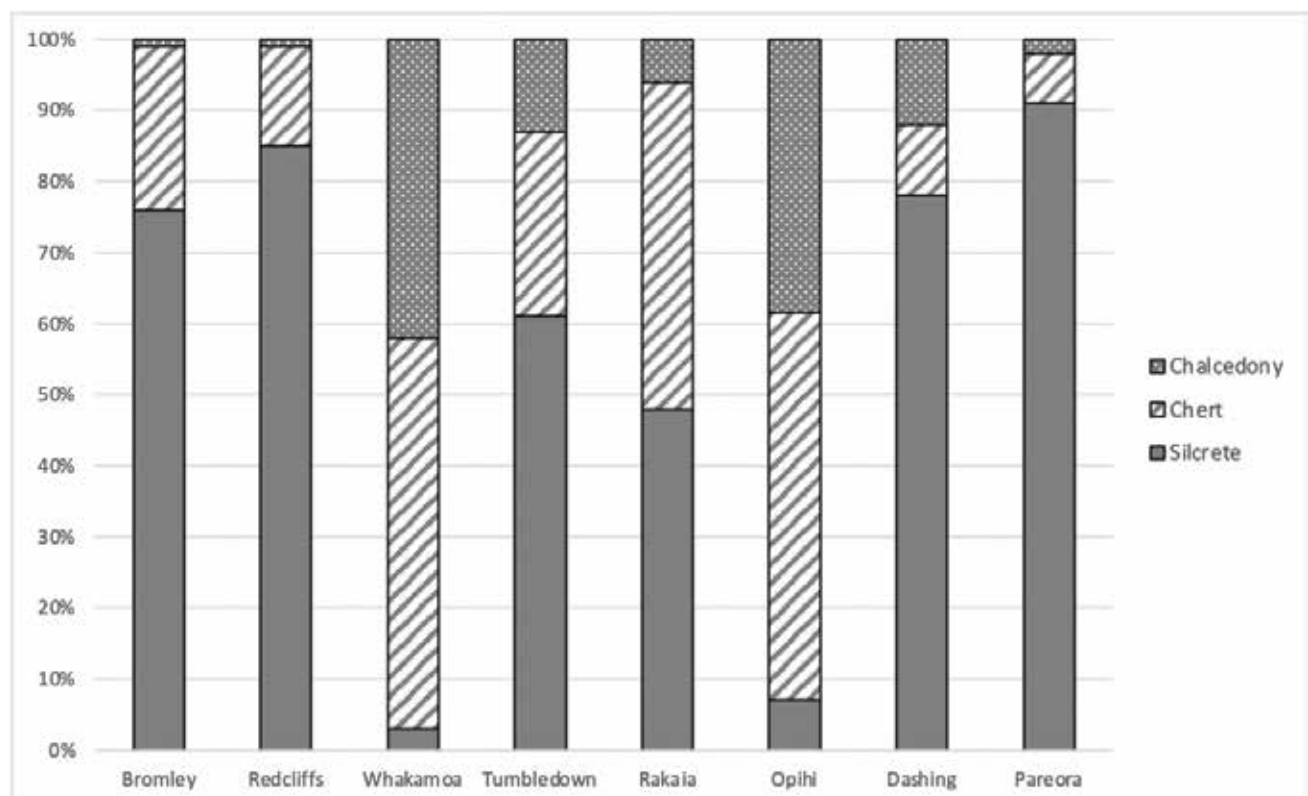


Figure 12. Geographic variation in the use of silcrete, chert and chalcedony at sites along the Canterbury coast, from north to south. See Fig. 1 for location of sites

Table 4. Numbers of artefacts of specific rock types from key archaeological sites in Canterbury. See Figure 1 for locations of sites. X = present. ¹Collection from School Section only (see also Trotter 1975). ²Data mainly from Jacomb (2000). ³Collection from various sites in the Lake Aviemore area, including Woolshed Flat (site I40/27). ⁴Repositories: CM – Canterbury Museum, SCM – South Canterbury Museum, OM – Otago Museum. ⁵Jacomb (2000) recorded 19 meta-argillite and 364 pounamu adzes from Panau.

SITES	Bromley	Redcliffs ¹	Panau ²	Whakamoa	Tumbledown	Waikakahi	Rakaia	Opiti River	Dashing Rocks	Pareora	Aviemore ³
Site no.	M35/323	M36/24	N36/72	N37/14	N37/12	M36/78	L37/4	K38/11	K39/1	J39/29	I40/27+
Repository ⁴	CM	CM	CM	CM	CM	CM	CM	CM	CM, SCM	OM	CM
IMPORTED											
Meta-argillite	>84	330	X ⁵	3	58	1	128	8	12	3	1
Pounamu (nephrite)	>21	28	X ⁵	>12	12	3	28	8	13	6	
Obsidian	222	135	6	5	108		102	4	62	3	
Porcellanite					2		30			12	30
Rodingite	2	3	1?								
LOCAL											
Greywacke	4	1	36	14	50	80	17	1	30	23	26
Basalt	9	178	13	12	127	5	9		3		
Silcrete	215	1100	9	1?	112	4	485	18	157	590	183
Sandstone	75	124	192	14	41	21	2	3	9	8	1
Chert	66	186	5	18	48	9	461	133	19	45	
Chalcedony	3	4		14	23	6	62	93	24	12	
Opal				2			8		3		
Quartz		1		1	4			1			
Palla	43	2			9		13				
Red argillite	1	6					2			1	
Argillite/slate	6		X						1	6	9
Wakanui pitchstone					1		1?		10		
Panau flint (informal name)			45	c.60	1	5		1			
Ochre/kokowai			X	>3	1		1				
Schist	13	2	5?		3	1		1	1	3	11
Quartzite		1?			1	5		2			
Black speckled chert							13		1	2	2
Other						1	2		1	3	
TOTAL	764	2101	>312	159	601	141	1364	273	346	717	263

Table 5. Approximate numbers of artefacts of imported (Kaikōura) and local chert

Site	Total	Kaikōura chert	Local chert	Uncertain
Bromley	66	58 (88%)	1	7
Redcliffs (School)	180	178 (99%)	2	-
Tumbledown Bay	48	14 (29%)	26 (54%)	8
Rakaia*	456	245 (54%)	211 (46%)	10
Opihi River	133	19 (14%)	113 (85%)	1
Dashing Rocks	19	5 (26%)	10 (53%)	4
Pareora	45	26 (58%)	18 (40%)	1

* Of one collection of 238 flakes, cores and pieces of chert examined from the Rakaia site (2008.1105.22, 34) at least 63% (65% by weight) were confidently attributed to Kaikōura

Geographic Variations

In Canterbury, the main lithic materials employed for flake tools (apart from obsidian and greywacke) were highly siliceous silcrete, chert and chalcedony, and these are practically the only ones for which there are sufficient quantitative data to permit an examination of intra-regional variations in use. Figure 12 shows the approximate proportions of these rock types in both Early and Late period sites along the Canterbury coast, as well as at Tumbledown Bay which is regarded as a Mid to Late period site. Clearly, silcrete was the dominant material used at Early period sites in the north and south (Bromley, Redcliffs, Dashing Rocks, Pareora), but at Rakaia chert was almost as common. Chert and chalcedony were used more extensively at the Late period sites of Whakamoia and Opihi River.

As outlined earlier, the bulk of the chert came from two main sources, the Kaikōura area (Kaikōura chert), and mid Canterbury area (from the Mt Somers Volcanics), though some of the so-called local chert found at sites in South Canterbury could be from undocumented sources in North Otago. A very small quantity was obtained from near Pareora (Gordons Valley chert, Moore 2019) and apparently also the West Coast (Pahautane chert).

The approximate proportions of the two main types of chert are given in Table 5, and illustrated in Figure 13. It is evident from the collections that have been examined that there was, as we might expect, an overall decline in the use of Kaikōura chert southwards. Notably, this was the case regardless of the age of the sites. At Bromley and Redcliffs its use was very high, but at Opihi River it constituted only about 14%. Local chert was more widely utilised south of Banks Peninsula.

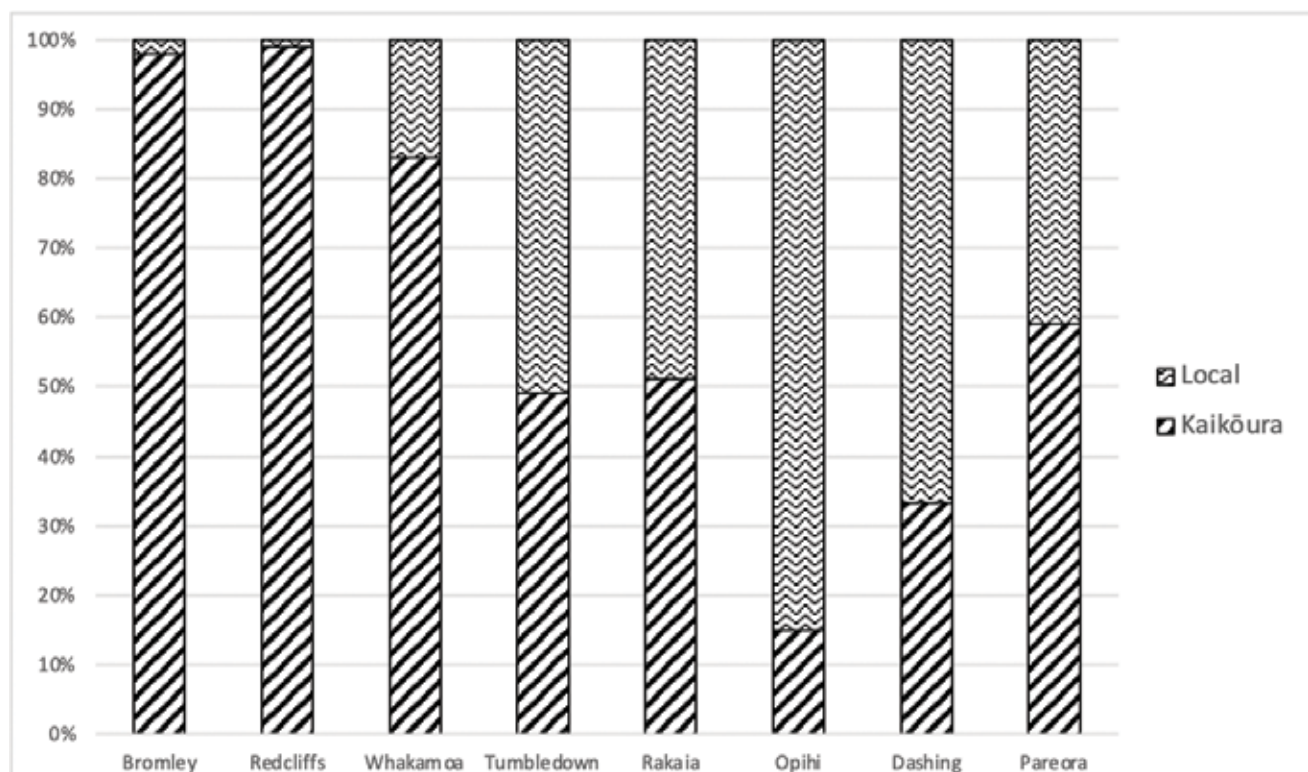


Figure 13. Proportions of Kaikōura and local chert at sites along the Canterbury coast, from north (left) to south (right).

Table 6. Chronology of Canterbury sites (* = radiocarbon dated). Ages mainly from Anderson (1991), Challis (1995) and Jacomb (2000, 2005, 2009)

EARLY (c.1300–1500 AD)	MID (c.1500 –1600 AD)	LATE (c.1600 –1850 AD)
Bromley	Tumbledown Bay* (16 th –17 th Century)	Panau* (16 th –19 th Century)
Redcliffs*(14 th –early 15 th Century)		Whakamoia
Rakaia* (14 th Century)		Opihi River
Dashing Rocks		
Pareora		
Aviemoie* (13 th –15 th Century)		

Temporal Changes

Many of the differences in lithic assemblages appear to be more closely related to the age of the sites. Unfortunately, few sites have been reliably dated, so for others it is necessary to make an assumption about a site’s antiquity based upon the general nature of the artefact assemblage and presence/absence of moa bone. For the purposes of this study, sites have been classified as Early, Mid and Late (Table 6), although the existence of a Mid or transitional period between Early and Late is a matter of debate (Davidson 1984; Challis 1995; Anderson 2016).

Some sites are difficult to place within a single age bracket. At Panau, for example, there is dating evidence of initial Early occupation, though the bulk of the site is considered to be Late (Jacomb 2000). The undated

Opihi River (Greenstone Island) site also appears to be relatively late, based on the presence of nephrite artefacts and the fact it was seen to be palisaded (site record form for K38/11), but certain artefacts (e.g. Duff Type 4A adze) from there are distinctly early.

The relative proportions of silcrete, chert and chalcedony at Early to Late period sites are shown in Figure 14. This more clearly illustrates the dominant use of silcrete during the Early period (except at Rakaia) and its significant decline in the Late period (at Whakamoia and Opihi) when it was largely superseded by chert and chalcedony. Its high use at Tumbledown Bay indicates that silcrete continued to be used in significant amounts, at least locally, into the sixteenth century.

Temporal variations in the use of imported and local chert are less marked (Fig. 15). Although there tended

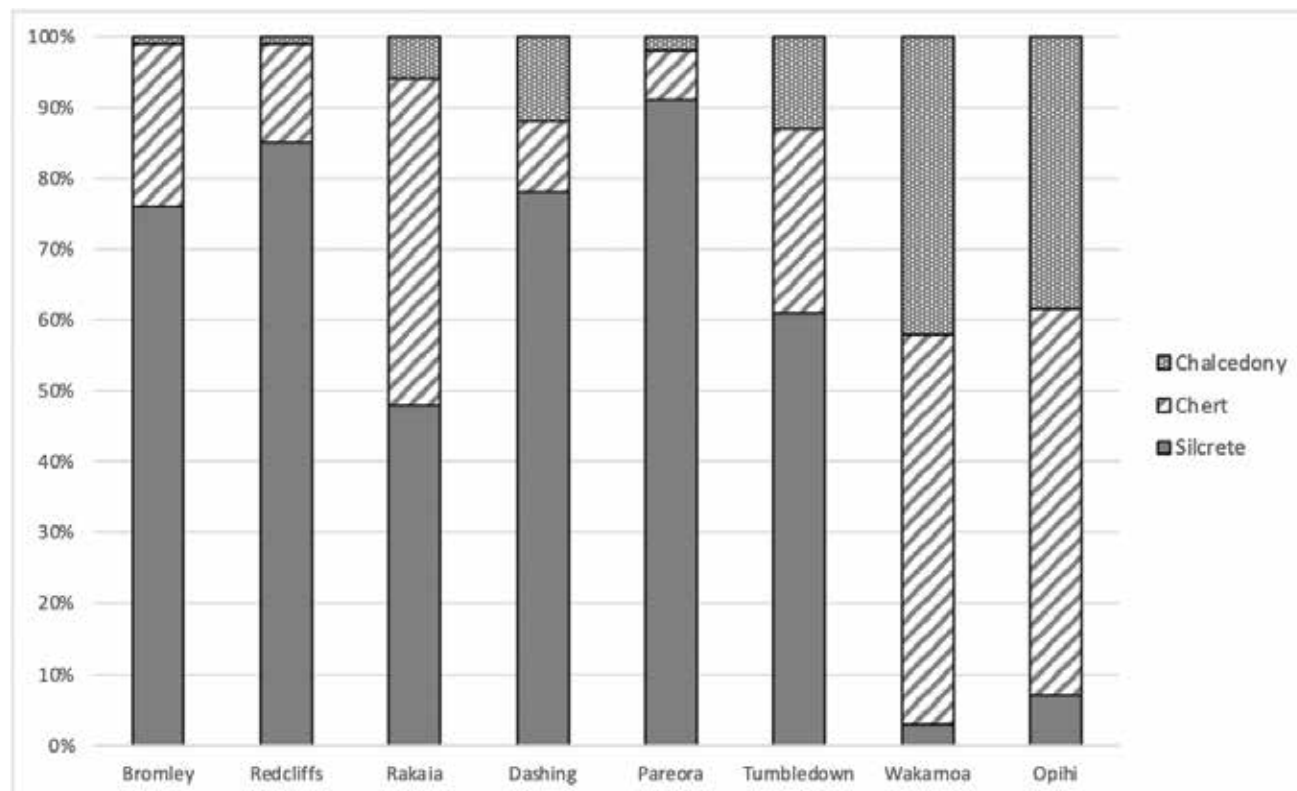


Figure 14. Use of silcrete, chert and chalcedony at Canterbury sites, according to age (older to younger from left to right). The order among Early period sites is not necessarily correct. See also Table 6

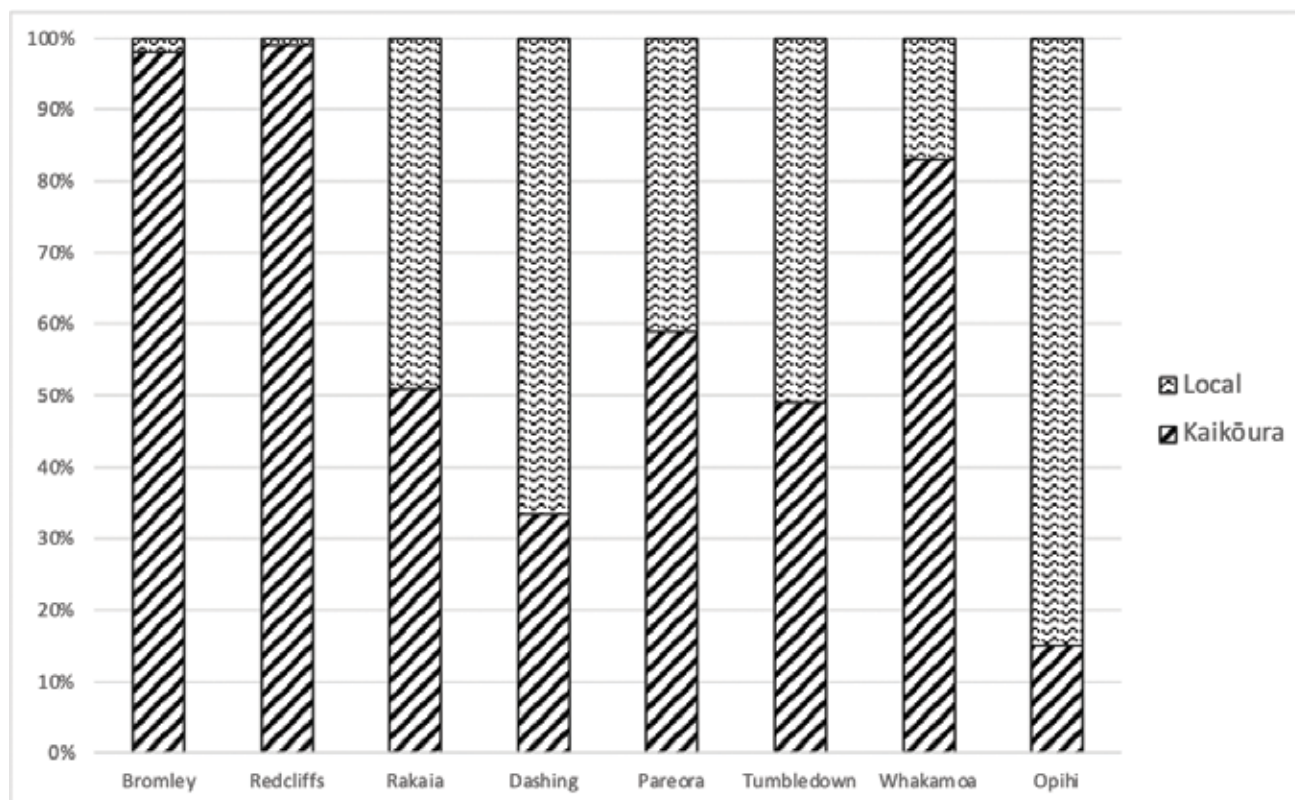


Figure 15. Temporal variations in the use of chert at coastal sites, from early (Bromley to Pareora) to late (Whakamoa, Opihi). The order of Early period sites is not necessarily correct.

to be an overall decline in the use of imported Kaikōura chert in the Early to Mid period, its use at the Late period site of Whakamoa for example was unusually high.

Temporal Markers

The potential for using certain rock types as temporal or chronological markers, at least on a regional scale, has been largely overlooked in the past, except for a few broad changes such as the dramatic increase in use of

Table 7. Chronological distribution of selected rock types.

Site/period	Silcrete	Porcellanite	Palla	Red argillite	Pitchstone	Black chert	Panau flint
LATE							
Panau	9						45
Whakamoa	1?						60
Waikakahi	4						5
Opihi River	18						1
MID-LATE							
Tumbledown	112	2	9		1		1
EARLY							
Bromley	215		43	1			
Redcliffs	1100		3*	6			
Rakaia	594	20	73	2	1?	13	
Wakanui #	X	X	10		>12		
Dashing Rocks	157				10	1	
Pareora	590	12		1		2	
Aviemore	183	30				2	

Data from Mosley and McCoy (2010), Moore and Trotter (2017), and personal observation

*This is the number recorded from the School Section only. A further 17 were reported by Moore and Trotter (2017)

pounamu, which is well documented (Walter et al. 2010). Minor rock types, however, are probably more likely to have been exploited over a relatively short time span (a few decades?) and, where found at multiple sites, not only imply some interaction between communities but that the occupation of those sites was, in part, contemporaneous. The spatial and chronological distribution of silcrete and some of the less common rock types is shown in Table 7. As illustrated above, silcrete is relatively abundant at Early period sites but was still being used in small quantities at later sites, consistent with the situation in Otago (Hamel 2001). The occurrence of porcellanite, however, is patchy during the Early period and non-existent at all Late period sites.

Of the minor rock types, palla has been recorded only from Early period sites in Mid Canterbury (Moore and Trotter 2017) and Tumbledown Bay, although there is also one possible flake from Milford in South Canterbury. Artefacts of red argillite are also known only from Early period sites, including some in the Mackenzie Basin (Moore in prep b) and Otago (Orchiston 1974; Moore 2021b). The so-called Wakanui pitchstone has a very restricted spatial distribution and appears to be mainly associated with Early period sites. Black speckled chert has only been identified from Early period sites from Rakaia southwards. So far, Panau flint seems to be the sole minor lithology confined to Late period sites (and Tumbledown Bay), most of which are located on or near Banks Peninsula, apart from Opihi River (Fig. 6).

Clearly, Tumbledown Bay is an unusual site in containing abundant silcrete and other lithologies (porcellanite, palla, pitchstone) that appear to be mainly restricted

to Early period sites, but also a single flake of Panau flint. This site, however, consisted of three cultural layers (Allingham 1988) and it is possible that both the palla and Wakanui pitchstone came from the lowest level (Layer 3) while the flake of Panau flint was found in the upper Layers 1 and 2. The earliest radiocarbon date for Layer 3 is AD 1447–1635 (NZ7656, charcoal; Challis 1995) at 95% confidence, which is backed up by a second date (NZ7654, shell) of AD 1490–1670. This could indicate, potentially, that both palla and Wakanui pitchstone were still being exploited in the late fifteenth or sixteenth century. Alternatively, a few artefacts of these lithologies might have been scavenged from an older abandoned site.

The known archaeological distribution of three of the Early lithic markers is shown in Figure 16. This reveals a somewhat different distribution pattern for palla than for Wakanui pitchstone and black chert. It may reflect the use of these materials for different purposes (i.e. palla primarily for adzes, the others for flake tools), but the presence of all three rock types at Rakaia and occurrence only of palla at Redcliffs and Bromley would seem to suggest some differences in how or when materials were being procured. It is likely there were only single sources for these rock types, as appears to be the case for palla (Moore and Trotter 2017).

The distribution of black speckled chert could indicate a direct connection between the settlements at Rakaia, Dashing Rocks, Pareora and Lake Aviemore. If so, there is a case for arguing that all of these sites were more-or-less contemporary, although radiocarbon dating of the Dashing Rocks and Pareora sites would be required to substantiate that.

Discussion and Conclusions

The widespread occurrence of similar rock types at early Moa-hunter sites in Canterbury demonstrates that distribution or exchange networks were already well established with the Nelson-Marlborough region, Otago-Southland and West Coast/Westland, as well as the North Island, by the fourteenth century. It is also evident that there was considerable exploration of the Canterbury region at this time, resulting in the utilisation of a range of local rock types including basalt, silcrete, chert, chalcedony, palla and red argillite. The presence of some distinctive minor lithologies at multiple sites is probably indicative of a direct connection between early communities occupying the Canterbury coast.

By the sixteenth century, however, there is evidence of a significant decline in the use of silcrete, obsidian and porcellanite, as well as the abandonment of some local materials such as palla and red argillite. Instead, there was greater emphasis on the use of chert and chalcedony, and of imported pounamu. The utilisation of Panau flint at Late period sites on Banks Peninsula could be a

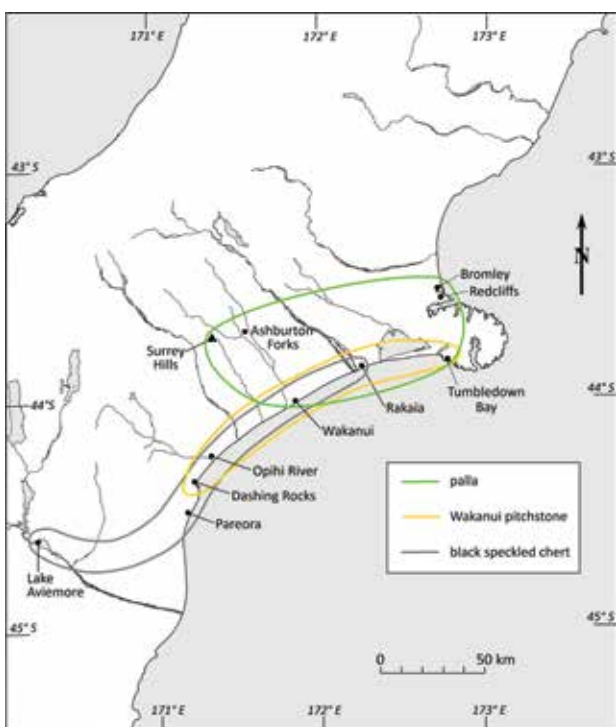


Figure 16. Spatial distribution of some minor rock types

response to the difficulty in obtaining obsidian from the North Island. These changes likely reflect a breakdown of the early long-distance exchange networks and decreasing access to certain lithic resources, with the exception of pounamu.

There is still inadequate information on how long some of the local stone sources were utilised for. In the case of silcrete there are indications that quarrying at Grays Hills began quite early, probably in the late thirteenth or fourteenth century (Moore et al. 2020), but for Miro Downs this is much less certain. However, the relative abundance of silcrete artefacts at both Tumbledown Bay and Houhoupounamu (Challis 1995) suggests that Miro Downs in particular could have been exploited well into the sixteenth century. As for palla, there is good evidence the Surrey Hills source was first utilised in the fourteenth century (Moore and Trotter 2017), although the discovery of a few flakes at Tumbledown Bay raises the question of whether raw material was still being procured from this source in the sixteenth century, or old artefacts were being recycled.

In the case of Wakanui pitchstone and black speckled chert, it seems unlikely they were utilised for more than a decade or so given that the sources of these materials, wherever they are located, were probably small and the pitchstone is of poor quality. Both were being used in the fourteenth century, but again the presence of one flake of pitchstone at Tumbledown Bay does raise the issue of recycling. The use of Panau flint only at Late period sites on Banks Peninsula and at Opihi River suggests this material may not have been discovered by Māori until the sixteenth century. It is highly unlikely that the source was located in the fourteenth century and not exploited, so its discovery may be related to the increased clearance of forest on the peninsula; assuming, of course, the source was on Banks Peninsula.

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Margaret Stoddart and her Visits to the Chatham Islands in 1886–1887 and 1891, Reconsidered

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The focus of this article is the Canterbury born painter Margaret Stoddart (1865–1934), who became one of New Zealand's leading botanical artists in the years leading up to the turn of the twentieth century. It follows the developments in her painting style as a botanical artist, from her student days at the School of Art in Christchurch up until her departure for Europe in 1898. During this period, Stoddart undertook two very significant sojourns to Rēkohu/Wharekauri (Chatham Islands), to record the endemic and native vegetation of these islands. Many of these botanical studies now form part of a larger collection of works by Stoddart in Canterbury Museum. This article reviews her early career when she was producing these works and showcases the true breadth of her work in an illustrated catalogue of her botanical studies which have until now remained unpublished.

Keywords: botanical art, New Zealand flora, special collections, women artists

Preamble and Introduction (Vickie Hearnshaw)

During 2020 I visited Wharekauri, the historic property situated on the north coast of the main island of Rēkohu/Wharekauri (Chatham Islands), which was taken up by Edward R Chudleigh (1841–1922) in 1866. It was here that Canterbury born painter Margaret Olrog Stoddart (1865–1934) had stayed on her two extended sojourns to the Chatham Islands in 1886–1887 and in 1891, to paint the local flora. My friend and colleague, the late Julie King (1945–2018), who has undertaken the most comprehensive study on Stoddart to date, had herself not travelled to the Chathams. This visit would be in her stead.

I travelled north from the settlement of Waitangi, through the expansive landscape of the main island. For much of the journey the route was bordered by Te Whanga Lagoon on one side, while on the other was the low-lying ground cover of the early Wharekauri Run. Finally I reached the northern coast, and from here the remnants of a succession of giant sand dunes remained to be traversed before the road dipped down to the sea. It was at this point that the present-day homestead came into view. It was nestled within its original grounds, which were planted by Chudleigh and his wife Mabel in many exotic species sent by Mabel's father Thomas H Potts (1824–1888) of Ōhinetahi in Governors Bay in Canterbury.

The present owners of the homestead, Murray and Jill Dix, were both welcoming and responsive to any questions fielded about the early years on the Chatham Islands, especially about Chudleigh and Margaret Stoddart. With regard to the latter, the Dix's referred to a letter they had received from someone seeking information on an

undated seascape by Stoddart, in oil on canvas, of the Chatham Islands' coastline (Fig. 1). This was surprising to me, as few landscapes by her are documented from this period, and her use of the medium of oil paint has not been well recognised. The received narrative of Stoddart is first and foremost as a flower painter who only took up landscape painting in her middle years, and she was certainly not known for oil paintings or landscapes



Figure 1. *Towards Cape Pattison, CI*. Undated, 585 x 480mm, oil on canvas, Private Collection, Christchurch. Photograph: Vickie Hearnshaw

at this early date. This painting also demonstrates that Stoddart's scope of practice while on the Chathams may have been more diverse than previously acknowledged.

On my return to New Zealand, and as the starting point for a future study on Margaret Stoddart, her time in the Chatham Islands, and her contribution as a painter of New Zealand flora, I referred to Julie King's (1997) biography and catalogue of works. This was followed by a visit to Canterbury Museum to view the collection of botanical studies on paper by Margaret Stoddart. Of these, only a small number (less than 20 works) have definitively been confirmed as being Chatham Islands flora. The Museum's full collection of Stoddart's botanical paintings are presented in the accompanying catalogue, assigned numbers 1 to 85 by the authors.

It was during my visit to the Museum that I met Frances Husband, an Associate Curator Human History. We informally came to an arrangement to work towards re-examining aspects of Margaret Stoddart's life and work in the period leading up to her visits to the Chatham Islands in 1886–1887 and 1891. The full breadth of Stoddart's work in the area of botanical study has not previously been showcased, and so the purpose of this article would be to address this gap and focus on her early career. Attention would be given to her development as a painter during her formative years as a student at the Canterbury College School of Art while living with her family in Christchurch. In addition, we would examine her association with the Canterbury Society of Arts and her exhibiting record over these years.

We decided the main emphasis of the research would be on Canterbury Museum's collection of 85 botanical studies painted by Stoddart¹ along with some personal items, notably the scrapbook album dating from 1886 that Stoddart began while in the Chatham Islands², and a family photograph album.³ We would also commission conservator Lynn Campbell to produce an independent report into the medium Stoddart had used in these studies (Campbell 2021), in order to clarify aspects of her working practices. The oil painting of Chathams landscape *Towards Cape Patisson, CI* (Fig. 1) would therefore lie outside the scope of this study but we believe it to be a potentially interesting avenue for future research.

We also consulted contemporary sources relating to Margaret Stoddart, most notably official records: these included the annual reports⁴ and minutes of meetings of Canterbury Museum⁵, and archival records of the School of Art⁶ and the Canterbury Society of Arts⁷. We conducted a survey of the press coverage of the day to gain an understanding of her reception. Personal documents such as Chudleigh's diary⁸ were considered a reliable source for Stoddart's activities and movements while on the Chathams, and likewise the writings of Thomas H Potts – in particular, material relating to his observations on the vegetation of the Chathams (Star 2020: 262–272).

As a keen conservationist, Potts would have been aware that although there had been extensive work undertaken illustrating the flora on mainland New Zealand, there had yet to be any comparable undertaking for the Chathams. Potts was a well-known figure in public life in New Zealand, as an elected representative at a provincial and national level. In the 1870s and 1880s he was on the board of Canterbury Museum. As a close friend of Margaret's father Mark Pringle Stoddart (1819–1885) and his family over many years, Potts was able to lend support and encouragement in furthering Margaret's career as an aspiring botanical painter. It is fair to say that Margaret's father's connections in Canterbury would have initially placed her in a favourable position with regards to networking opportunities. For instance, was it Potts who encouraged her to take time out of her art studies, to travel to the Chathams to paint the local flora? After all, he was in the singular position to be able to arrange for Stoddart to stay with members of his family, the Chudleighs, at their property at Wharekauri in the Chathams. At the same time, however, we are mindful that a discussion of these familial connections should not detract from her achievements as an artist and the significance of the body of work she produced.

Women's Role in Botanical Art in New Zealand

It was probably the arrival in New Zealand of the English painter, Marianne North, that was responsible for the widespread interest in the documentation of New Zealand flora by women. North arrived in March 1881 and painted the local flora wherever she travelled. Her presence certainly would have demonstrated the unique role that women with the right skills could play. While in New Zealand, North was in the privileged position of being hosted by the leading figures in the community and therefore had special access to them. In Christchurch, for instance, she was the guest of Judge Johnston, the co-vice president of the Canterbury Society of Arts with Sir Julius von Haast (1822–1887), the Director of Canterbury Museum. While she was there, North made a visit to the Museum with her cousin and Museum board member John D Enys (1837–1912) of Castle Hill Station. Subsequently, she travelled up country with him, where she spent several days in the Arthur's Pass region. In her diary, North records how she produced several sketches in oil of the local flora (North 1892: 109–11; Dawson 1999: 2). This included one of the southern rata in bloom, so emblematic of the area at that time of year, which is now in the collection of the Marianne North Gallery at the Royal Botanic Gardens in Kew, England.⁹ Then, in Wellington, North stayed at Premier House with Sir John and Lady Hall. While she was there, Lady Hall arranged for an intimate exhibition of North's paintings to be hung in the ballroom at Premier House for invited guests (*Lyttelton Times*, 30 March 1881: 4).

Several studies have examined the context in which women such as Marianne North emerged as recorders of New Zealand's local flora from the early days of European

settlement (Elias 1991; Clendon 1992; Field-Dodgson 2003). As a botanical painter who was widely recognised in her own day, but not herself a published artist, Margaret Stoddart was regrettably overlooked or referred to only in passing. Here, we return attention to Stoddart's early painting in an effort to balance the record which, in terms of art history, favours her later paintings. Some of this favouritism is probably due to the fact that these early works are housed in a museum and not an art gallery. Stoddart seems to have been aware of the different audiences for her work, given that she was connected to both the Canterbury Museum and the Canterbury Art Society. But it is to Bee Dawson in her survey of lady painters that we must turn to find Margaret Stoddart and her contribution to botanical art acknowledged among her peer group (Dawson 1999).

In the introduction to her study Bee Dawson suggests that a driver for women's personal interest in the flora had often developed out of their general curiosity about the unfamiliar landscape around them. She notes that as women painters were working within the strictures of colonial society they often had to overcome certain barriers, such as difficulties collecting their plant specimens (Dawson 1999). Few women painters were known to be as able as Margaret Stoddart and therefore they were often reliant on local botanists sending them plant materials. Yet there was an unexpected advantage to this, as it allowed these women to develop an informal network with local botanists working out in the field. Dawson mentions, for example, the interaction of plant collectors William Colenso and Archdeacon W L Williams with botanical artist Sarah Featon, of Gisborne.

By the 1880s support for these women artists had progressed from a local to a national level. Drawing directly on Sampson, Dawson recounts how Thomas F Cheeseman (1845–1923), Curator of the Auckland Museum, lobbied the central Government of the day on behalf of Georgina Hetley (1832–1898). As a result, under the premiership of Robert Stout a system of travel vouchers was initiated for these artists to cover their travel (Sampson 1985: 103; Dawson 1999: 2). Hetley, for instance, received support for her travels over a 2 year period from 1884. During this time, she travelled throughout the North Island and the northern half of the South Island to paint plant specimens. Hetley records in her diary journeying through the Buller Gorge and Arthur's Pass, before crossing into Canterbury in early 1886 (*Lyttelton Times*, 30 March 1886: 6). Later the central Government lent her further support by placing orders for her forthcoming florilegia in three volumes, in advance of its publication in England in 1888 and 1889, for schools and public libraries (Hetley 1888). It is worth noting that her contemporaries, Emily Harris in Nelson and the Featons in Gisborne were also compiling florilegia intended for publication (Featon and Featon 1889; Harris 1890), which shows the extent of work being done to document New Zealand flora.

Margaret Stoddart may have also been a recipient of this support system. A reference in a Canterbury Museum exhibition catalogue in 1977 states that Stoddart had received assistance from the Government of the day.¹⁰ Although the exact nature of this assistance is not detailed, there is every reason to suppose that any assistance she received would have been similar to that received by Hetley, and therefore in the form of government vouchers to cover her travel costs.

Stoddart's Personal Journey

Stoddart was only 15 at the time of North's visit to Christchurch, and probably did not meet her in person. However, many of those around her would have understood the significance of North's visit and the unique role that women who specialised in botanical painting could play as illustrators of the local flora. As a young woman of the next generation, Stoddart was a direct inheritor of this artistic tradition. Yet she had an advantage over these earlier women, as by this date there were more opportunities for women in education – in particular, for women anticipating furthering their education at a tertiary level.

In March 1882, the Canterbury College School of Art opened in Christchurch (*Lyttelton Times*, 2 March 1882: 2, 4) under the direction of headmaster David Blair (Chalmers 1988: 111–115). Rather exceptionally, all four Stoddart sisters enrolled at the school as foundation students. The two older girls, Frances and Margaret, entered the course of study, which was offered through the National Art Training School in London and recognised throughout the English-speaking world (Turpin 1983). Frances went on to complete this course in 1885 but for some reason Margaret, who was arguably the more able sister of the two, discontinued her studies midway through 1884. She recommenced her studies on her return from her first sojourn on the Chatham Islands in the second half of 1887 and completed the second grade full certificate in 1889 (King 1997).

At this point in time, we can only speculate why Stoddart may have deferred her studies for 3 years. Certainly her father, Mark Stoddart, was known to be in declining health. Margaret may have found that her presence at home to assist within the household was increasingly required in the period prior to his death on 28 August 1885. Or did she take time out of her studies at the School of Art to concentrate on botanical painting in preparation for her proposed trip to the Chatham Islands? It is clear from her exhibiting records that she was devoting considerable energy to her painting. There were a number of references to botanical studies, suggesting that it was this area she was focusing on¹¹. Indeed, in March 1886 Stoddart's contribution to the study of depicting native plants was mentioned in an announcement about Hetley's forthcoming publication in the newspapers of the day:

*Few people are aware either of the great beauty or the astonishing variety of our native flowers. In this city, Miss Stoddart has done a little towards making the untravelled acquainted with a number of their forms, but Mrs Charles Hetley, of Auckland, has undertaken a very much more arduous task. This is nothing less than the publication of *The Native Flowers of New Zealand*. (Lyttelton Times, 30 March 1886: 6).*

Stoddart had become a working member of the Canterbury Society of Arts in 1883 and was elected to its committee as soon as 1885. Early recognition by the art society came in the form of the purchase of two of her paintings shown at their annual exhibition in 1885 for their permanent collection.¹² A further measure of her success came with the selection of four of her botanical studies for inclusion in the New Zealand section of the Colonial and Indian Exhibition to be held in London during 1886, with von Haast as commissioner (Blaikie 1887)¹³. These paintings were hung at the Royal Albert Hall with those of other women botanical painters from New Zealand, including Hetley and Harris (*New Zealand Herald*, 31 July 1886: 4).

It was while Stoddart's paintings were on display in London that they came to the attention of J A Blaikie, art critic for the *Magazine of Art*. He described how:

The majority of the flower-pieces aim less at decorative effect than scientific accuracy. Miss Margaret Stoddart's "In the Bush" and "Mountain Daisies", may be noted as successful treatment of still-life from an artistic point of view. The latter painting is not merely a good botanical study but an agreeable essay in decoration. (Blaikie 1887: 36)

Present-day botanists recognise the value of Stoddart's botanical studies for the same reasons. On viewing examples of her botanical paintings in her scrapbook, one was quoted as saying that, "I find the plant portraits are both pleasing in composition and botanically accurate enough to allow identification" (Wright and King 2016: 42).

Botanical Illustrations and Photography

Julie King describes how botanical flower drawing and painting was one of the subjects taught at the School of Art from an introductory level (King 1997: 39). She explains how students in these classes were taught to identify botanical characteristics and draw them in detail, giving close attention to each part of the plant, including undertaking close studies of such details as the way the leaf is attached to stem. King emphasises how this training made it clear of the requirement for accuracy in all representations (King 1997). As an entry level student, Stoddart would have attended these classes.

Even now that photography has largely taken over as preferred medium for the representation of plant material (Sampson 1985: 11), the trained botanical illustrator continues to have a vital role. For example, they isolate features which matter such as the shape of a seedpod, adventitious roots or leaf margins (Hickman et al 2017: 291–325; Westlake 2019) and have the ability to represent the changes in plants over the seasons. Such detail can be useful when identifying a plant, particularly those with many varieties within a single species.

It appears from a photograph in Stoddart's scrapbook (Fig. 2), that she employed both photography and paint to document the local flora. There is no definitive evidence that gives us an insight into her actual approach to her work as a botanical artist, but two photographs of plant specimens in Stoddart's scrapbook may be instructive¹⁴. Stoddart may have simply employed these photographic images as visual aids. The photograph of the clematis was taken of the flowering plant in its natural habitat; this could well have been useful for capturing the nature of the massing of flowers, for example, for the panels of clematis (*Clematis paniculata*) she painted on a folding screen and exhibited at the New Zealand and South Seas exhibition in Dunedin in 1889–1890. The second, smaller photograph of hīnau (*Elaeocarpus dentatus* var.

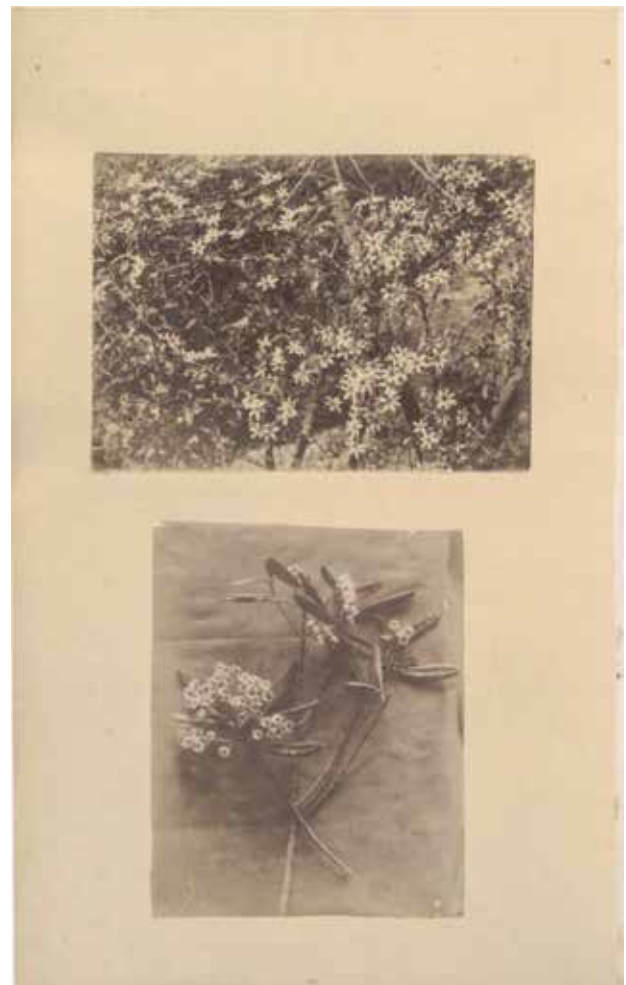


Figure 2. Photographs of clematis (upper) and hīnau (lower), Margaret Stoddart scrapbook (Album Two), 1886–1897, p49. Canterbury Museum 2015.115.142, 2015.115.143, 2015.115.1

dentatus)¹⁵ pinned on paper to the wall may demonstrate how she set up a plant specimen (gathered herself) prior to commencing her work (Fig. 2).

As can be seen in the accompanying catalogue, Stoddart's botanical paintings in Canterbury Museum's collection are stylistically similar to one another, although her brushwork does become freer as the years progress. All the botanical gouache works are painted onto toned paper, such as green or grey. The oil paintings in the collection are treated in the same manner and the backgrounds have been painted in a similar neutral palette as if to emulate the other works. She has often incorporated a small sketch in pencil or paint of the flower head, shown at different angles, and sometimes a small sketch of the leaf form. She has taken care to show the details of the plants such as the underside of leaves, as in *Corokia macrocarpa* (see page 92)¹⁶ where the leaves are pale underneath.

Stoddart's First Visit to the Chatham Islands, 1886–1887

On 19 April 1886, Stoddart, with the 12 other passengers on board the brigantine *Omaha*, reached the northern coast of the Chatham Islands. As the ship dropped anchor offshore at Wharekauri, along with feelings of anticipation, for Stoddart there may have been feelings of apprehension, given the proposed length of her stay in such an isolated part of the world. In his diary for 19 April 1886, Chudleigh recorded her arrival, albeit in a perfunctory manner. He wrote, "Miss Stoddart and a servant girl for us [arrived]"¹⁷. His address might appear formal to us and at the time he was not well acquainted with Stoddart. However, it should be noted that he usually refers to her hereafter as Margery or Maggie¹⁸, as his special name for her, rather than Margaret. From his diary we also learn that over the first months of her stay inclement weather would have plagued her. Chudleigh describes how the winter of 1886 was one of the longest and most bitterly cold in memory. On 31 August, he writes in his diary, "I hope the new month will commence with new weather, for the last four have been enough to make one tired of life"¹⁹ – a factor that in all probability would have set back Stoddart's plans for collecting plant specimens to paint, and therefore potentially her overall output as a botanical illustrator.

From Chudleigh's diary and Julie King's study, we get more idea of her movements while she was on the Chathams and who she met during the course of her stay. For instance, at the beginning of 1887, we learn that Stoddart has made a trip to Pitt Island. Then on her return she spent one month with the Shand family at Te Whakaru, on the northeast coast of the main island (King 1997: 9). It was while she was staying with the Shands that she had the opportunity to visit several nearby sites of cultural significance to Moriori; notably the rākau momori/dendroglyphs in the Hāpūpū Reserve, and petroglyphs at Te Ana a Nunuku (the cave of Nunuku) at Moreroa. At both these locations Stoddart took out her paintbrushes

to record them²⁰. The studies she undertook at these sites are included in the scrapbook she began while in the Chathams. In relation to her time with the Shand family, we should note how Stoddart gave over one page in her scrapbook to a montage of two photographic images of the "Te Whakaru" homestead, taken by Alfred Martin in the 1870s, which she framed with painted boughs of fruiting karaka (locally known as kopi trees) and with her impressions of the rākau momori/dendroglyphs in the Hāpūpū Reserve and the petroglyphs at Nunuku's cave²¹ (Fig. 3).

There had been interest in gathering information about the Chathams since the early days of European settlement: Dr Ernst Dieffenbach, Charles Heaphy and Reverend R D Hanson had made the first visit on behalf of the New Zealand Company in the early 1840s. From that date, a succession of scientists and others came to make studies in relation to the local geology and the unique vegetation. All were interested in the morphological differences between mainland and Chatham Island species. Notable among these were F A D Cox who took up residence on the northern part of the main island in 1865, for his work identifying new species and sending specimens to the mainland, Henry H Travers who travelled to the Chathams in 1867 and 1871, and likewise Thomas H Potts in 1888.



Figure 3. Photographs of Te Whakaru, Chatham Islands, Margaret Stoddart scrapbook (Album Two), 1886–1897, p2. Canterbury Museum 2015.115.5, 2015.115.6, 2015.115.1

Since his arrival in New Zealand, Potts had written extensively on various topics relating to local natural flora and fauna of this country – principally for the *New Zealand Country Journal* under the running title of “Out in the Open”. This included writing of his experiences while he was in the Chatham Islands in 1888. He observed how the native vegetation cover of the Chathams had already been greatly modified by human activities. He gave the example of the iconic Chatham Islands forget-me-not (*Myosotidium hortensia*) (Star 2020: 273–278), a plant that had originally grown in abundance on the northern foreshore of the island but by the time of his visit was listed as vulnerable in the wild. What becomes clear on reviewing Stoddart’s paintings of the local flora is that this situation has not improved over the last 120 years – all of the species that she painted while on the Chathams can be found in Walls et al’s (2003) comprehensive list of Chatham Islands plants categorised as endangered, threatened or seriously in decline. For example, Stoddart’s beautifully observed botanical studies of the autetaranga or sand daphne (*Pimelea villosa*) and Chatham Island geranium (*Geranium traversii*) painted in November 1886²² provide us with a clear indication of the nature of these now at-risk coastal plants within their habitat (Fig. 4).

Christchurch 1887–1890

On her return to Christchurch in the company of Chudleigh in early June 1887, the latter arranged for his friend J D Enys to view the work that Stoddart had completed while she was on the Chatham Islands. Chudleigh recorded in his diary on 20 June, how “J D Enys and I called on Mrs Stoddart and saw Margery’s pictures”²³. It may be presumed that Chudleigh arranged this viewing with the intention of securing a selection of paintings for the Museum and that Enys, as a current member of the Museum board, was in a position to bring forward such a proposal.

However, several factors appear to have worked against Stoddart progressing her career as a botanical painter. On 16 August 1887, some weeks after her return to Christchurch, Haast died. This event was a major blow and would cause upheaval within the institution of the Museum for a considerable length of time.²⁴ Then in the following year, on 27 July 1888, her advocate T H Potts also died.

Nevertheless, Canterbury Museum did purchase two paintings from Stoddart for £5 in November 1887 while Potts was still on the committee – one of the dendroglyphs at Hāpūpū and another of a Moriori shoreline burial



Figure 4. Autetaranga/sand daphne (*Pimelea arenaria* now known as *Pimelea villosa*) and Chatham Island geranium (*Geranium traversii*). Gouache on buff paper, 350 x 270mm, signed and dated lower right ‘M.O.S. Nov. 22nd 1886’. Canterbury Museum 1907.7.75

site.²⁵ These were presumably among the works that Enys had viewed with Chudleigh several months before and that were exhibited by Stoddart at the Black and White exhibition organised by the Canterbury Society of Arts in September of that year.²⁶

Two days before Christmas in 1889 the Museum Curator, Henry Forbes, asked the Canterbury Museum Committee “for authority to employ Miss Stoddart to paint specimens of NZ flowers, [etc] for the Herbarium to help identification” but consideration by the committee was deferred,²⁷ and there is no further discussion in later minutes on the subject. King reminds us of Haast’s personal endorsement of the value of painting in public outreach (King 1996). This may lead us to believe that there had been earlier support from within the Museum for the placement of Stoddart’s work within the Herbarium. Stoddart would have been disappointed with this outcome. However, in March 1890, following an informal display of her botanical studies at Canterbury Museum, the Museum also purchased 12 botanical studies from the artist for a recorded sum of £6.²⁸ These works were framed and hung in the main New Zealand gallery in the Museum.²⁹ They now form part of the larger collection of botanical studies Stoddart presented on her return from Europe in early 1907 (*The Press*, 26 March 1907: 6; *The Press*, 27 August 1907: 4).³⁰

The 1890s and Stoddart’s Second Visit to the Chatham Islands

In the years leading up to her departure for Europe in early 1898 (*Lyttelton Times*, 12 February 1898: 2), Margaret Stoddart continued to actively engage in working on botanical paintings of New Zealand flora. This included a number of painting expeditions with friends and associates in Canterbury, notably into the Arthur’s Pass region, which she recorded in her scrapbook.³¹

Stoddart also made a return visit to the Chatham Islands in April 1891 (King 1997: 9). On this occasion she joined Bishop Churchill Julius and his party, who were travelling to the islands for the consecration of the church of St Augustine’s in the small settlement at Te One. Following these formalities, the bishop and his party spent several days on the main island before making the crossing to Pitt Island, and then returning to Lyttelton. Stoddart, though, stayed on in the Chathams until early July. Once again she was hosted by Edward and Mabel Chudleigh at Wharekauri. However, as Chudleigh made little mention of her second visit in his diary we are unable to chart her movements over this period. However, it is clear from the botanical studies dating from around this period in Canterbury Museum’s collection that Stoddart continued to work on botanical studies of local plants, with paintings dating from 1890, 1891, 1893 and beyond.

After this second Chatham Islands visit, Stoddart came to the attention of Australian flower painter Ellis Rowan

who was travelling in New Zealand for several months from late 1893 into 1894. On seeing her botanical paintings on display while in Christchurch, Rowan is said to have been very impressed. She was reported in an interview to *The Press* as saying that, in her opinion, Miss Stoddart “stands without rival, the first and foremost of our flower painters” and that “the grouping, colouring, form and harmony were perfect” (*The Press*, 3 September 1894: 4). For Stoddart, recognition by a fellow artist of such standing would have boosted her confidence in her ability as an artist. Further, Rowan invited Stoddart to travel to Australia later in the same year. While in Australia Stoddart visited Rowan at her home in Macedon, a rural town inland from Melbourne (King 1997: 59–61). Stoddart also held an exhibition of her paintings in Melbourne in August. Melbourne newspaper *The Argus* reported on the exhibition, explaining that Stoddart had brought a selection of work with her from New Zealand. This included several botanical studies of the flora of the Chatham Islands (*The Argus*, 21 August 1894: 5).

1907: Stoddart Donates her Collection to Canterbury Museum

On her return to New Zealand in early 1907 after 9 years in Europe, Stoddart presented her personal collection of paintings of New Zealand and Chatham Islands flora to Canterbury Museum (*The Press*, 26 March 1907: 6; *The Press*, 27 August 1907: 4). These were largely studies of native plants from the mainland, but several from the Chathams were also included. It is not possible to explain what prompted such a munificent gesture from her. Could it have been that, by this date, Stoddart may have considered that she had moved on as an artist? Certainly, reports in the local newspapers at this time intimate that there had been considerable developments in Stoddart’s painting style while she had been overseas.³² Or perhaps she was following the example of Sarah Featon, who had offered her remaining collection to the Dominion Museum (now the Museum of New Zealand Te Papa Tongarewa). Could Stoddart have presented her collection of botanical studies due to her concern that they be kept for posterity?

What is clear from the records of the Museum is that her presentation was well received.³³ A selection of 50 works from the collection was immediately framed and exhibited in an upper room of the Museum. Over the years the works have been often displayed; a note in Canterbury Museum’s Annual Report for 1918 describes how:

*The collection of Miss Stoddart’s paintings of New Zealand flowering plants has been assembled, re-arranged, and placed on display in the New Zealand Gallery, with a short description of each plant in simple non-technical language underneath. The thanks of the institution are specially due to Dr Cockayne, Mr R M Laing, and Prof. A Wall for valuable assistance in preparing the letterpress for this series.*³⁴

Later, a display was placed down the stairwell of the Museum, which in 1933 was commented on in *The Christchurch Star* newspaper, in a large piece titled “Museum Musings”. The writer muses that “one is grateful ... for the refreshing presence of the simple snowberry and the native heath and bluebells that bloom delicately in this place of bones and dust” (*The Christchurch Star*, 18 March 1933: 8).

Endeavouring to come to conclusions about the acquisition and accession of Stoddart’s works into the Museum’s collection is not always straightforward. In most instances, this is due to the time-lag between the acquisition and the cataloguing of particular items. For example, the 12 botanical paintings purchased in 1890 were, when catalogued, grouped into the larger collection presented in 1907 and given the same accession numbering system. However, we have hints as to which paintings formed the earlier group. The 12 works were described in a newspaper article from 1891 as “a series of oil paintings depicting some of New Zealand’s prettiest flora” (*The Press*, 20 February 1891: 4). Of the 85 botanical paintings by Stoddart in Canterbury Museum’s collection, there are 17 in oil. Furthermore, as the works were created over an 11-year period, the earliest recorded as 1886 and the latest as 1897, many paintings date beyond the 1890 purchase and therefore could not have been part of this earlier acquisition.

In addition, the two ethnological studies of Chatham Island scenes, purchased in 1887, were historically confused with a gift from Miss Shand in 1909 and retrospectively (mistakenly) given 1909 accession numbers.³⁵ At some later undisclosed date, possibly following the discharge of her estate after her death in 1934, the scrapbook produced by Stoddart dating from her first visit to the Chatham Islands in 1886, now known as Album Two, and the family photograph album dating from the 1890s now known as Album One, were also presented to the Museum.³⁶

Describing Stoddart’s Botanical Studies

A further consideration, and one no less significant, has been the lack of consensus among curators over the years as how to describe Stoddart’s botanical studies. They have been variously described as drawings, paintings and watercolours. The 12 botanical studies purchased in 1890 were initially recorded as drawings, rather than paintings; similarly, the large collection of botanical studies presented in 1907.³⁷

Inconsistencies also occur in the work of researchers. King, for instance, defined most of the botanical paintings she discussed in the body of her text as watercolour/bodycolour, yet in her chronology the same works were described as drawings. It was this matter that prompted the need for professional clarification of the medium employed by Stoddart in her botanical studies. The advice of conservator, Lynn Campbell, was therefore sought (Campbell 2021). From her analysis of



Figure 5. Rautini/Chatham Island Christmas tree (*Senecio huntii* now known as *Brachyglottis huntii*). Gouache on buff paper, 270 x 350mm, signed and dated lower right ‘M.O.S. Dec 31st 1886’. Canterbury Museum 1907.7.55

Stoddart’s works on paper, she was able to definitively establish that she used gouache. Campbell offered further insights. She explained how gouache as a medium is more opaque than watercolour. For Stoddart, working almost exclusively on toned papers, gouache would have brought substance to her botanical studies, in particular her use of white pigment for highlighting in many of these works (Fig. 5). In addition, Campbell points out that among the plein air artists that Stoddart associated with while she was in Europe, gouache was a widely favoured material (Campbell 2021). It is important to consider that Stoddart’s early preference for gouache working as a botanical painter could have later shaped the development of her style as a mature painter.

Conclusion

The years leading up to her departure for Europe in early 1898 were the period when Margaret Stoddart’s artistic focus was largely devoted to working on the representation of New Zealand’s rich and varied native flora. The two extended sojourns to Rēkohu/Wharekauri (Chatham Islands) undertaken 1886–1887 and 1891, arranged by T H Potts and hosted by Edward and Mabel Chudleigh on their property on the north coast of the main island, in particular, were important for her overall development. These visits provided her with the opportunity to hone her skills as a botanical artist, but also, given the length of each stay, the time to produce what is regarded as a remarkable record of the flora of these islands. A selection

of the botanical studies undertaken when Stoddart was resident in the Chatham Islands now forms part of a larger collection of works by the artist in Canterbury Museum.

The number of works in the collection presented to the Museum is significant at 85. Each is stylistically similar and evidently produced so that the plants can be identified. This signifies that Stoddart was building up a body of work and creating these works as a botanical artist, rather than as a flower painter; these botanical works were to be studied and used. The length of time that Stoddart spent creating these artworks and amassing the collection also indicates her desire to present a thorough study of the flora of New Zealand and the Chatham Islands. Her departure for Europe in 1898 marks the end of this type of painting, and when she returned to New Zealand her focus had considerably shifted to landscapes. The influences from Europe and overseas changed her artistic practice from that of botanical study to wholly that of an artist. The breadth of her work in the area of botanical study has not previously been published and it is hoped that through this article her early career can be highlighted.

Illustrated catalogue

An illustrated catalogue of all 85 botanical paintings by Margaret Stoddart at Canterbury Museum follows. This collection has not been published in full previously. These paintings are ordered by the date they were created, where this is known. Nine of the oil paintings are not dated, but as these are stylistically similar to the other oil paintings in the collection, and very likely created around the same time, they have been grouped together immediately following the dated oils. There are four undated gouache works in the collection, which are grouped at the end of the catalogue.

Stoddart has dated most works, usually in the lower corners of the paintings along with her signature or initials. For most paintings the date includes, along with the year, the day and the month. Some have the date written out in full, but she has also used solidus to separate the day, month and year.

We have chosen to order the catalogue by date for three reasons. First, it allows us to see how Stoddart's style progressed over the years that she was creating these botanical works. Second, we can identify which works were created prior to the Museum's 1890 acquisition. Finally, by the dates we can see which plants are definitely from the Chatham Islands. The collection mainly consists of mainland New Zealand plants, but the catalogue has her Chatham Island-made paintings grouped together amongst these other works.

Acknowledgements

We are indebted to Alex Fergus for his excellent work checking the plant names and identifications. Many thanks to Chris Hoopman for his photography of the paintings.

Endnotes

- 1 85 botanical paintings by Margaret Stoddart. Canterbury Museum Collection 1907.7.1–1907.7.85
- 2 Margaret Stoddart scrapbook (Album Two). Canterbury Museum Collection 2015.115.1
- 3 Margaret Stoddart scrapbook (Album One). Canterbury Museum Collection 2015.114.1
- 4 Canterbury Museum Annual Reports, 1890–1848, Canterbury Museum Archives.
- 5 Canterbury College Museum Committee Minutes, 1874–1890 and 1891–1908 Macmillan Brown Library, University of Canterbury (REFD 80607 and 40115).
- 6 Including the 1882 School of Art Roll Book, Macmillan Brown Library, University of Canterbury.
- 7 Records of the Canterbury Society of Arts, Christchurch Art Gallery Te Puna o Waiwhetū Archives.
- 8 Edward Chudleigh's original diary, 1 January 1886 to 31 December 1887. Canterbury Museum collection 34/49
- 9 Marianne North, View of Otira Gorge, 510 x 353 mm, oil on paper, 1881, Marianne North Gallery, Royal Botanic Gardens, Kew, England.
- 10 Exhibition catalogue of 'Studies of Native Flowers by Margaret O Stoddart', 1977, Canterbury Museum Archives, 2010.209 7/6 Box 1 Folder 10
- 11 Records of the Canterbury Society of Arts, Christchurch Art Gallery Te Puna o Waiwhetū Archives.
- 12 Records of the Canterbury Society of Arts, Christchurch Art Gallery Te Puna o Waiwhetū Archives. The CSA purchased two works from their annual exhibition in 1885: 127 *Mtn Lily* and 130 *Roses*.
- 13 The four works selected were In the Bush: *Yellow Kowai* [sic], *Mountain Daisies*, *Native Clematis* and *Native Coltsfoot*.
- 14 Margaret Stoddart scrapbook (Album Two), p2. Canterbury Museum Collection 2015.115.1
- 15 See also Margaret Stoddart's painting of *Elaeocarpus dentatus* var. *dentatus* (hīnau), 1889, oil on paper, 270 x 360mm. Canterbury Museum Collection 1907.7.40
- 16 *Corokia macrocarpa* (hokataka/Chatham Island matipo), painted 30 July 1886, gouache on buff paper. Canterbury Museum Collection 1907.7.4
- 17 Original diary of E R Chudleigh, 19 April 1886. Canterbury Museum Collection 34/49
- 18 Original diary of E R Chudleigh, 23 May 1886 and 30 May 1886. Canterbury Museum Collection 34/49
- 19 Original diary of E R Chudleigh, 31 August 1886. Canterbury Museum Collection 34/49
- 20 Monochromatic watercolour painting on paper of rākau momori (carved trees/dendroglyphs) in the Chatham Islands/Rēkohu/Wahrekauri. Painted by Margaret Olrog Stoddart in 1887. Canterbury Museum Collection 1909.27.2
- 21 Margaret Stoddart scrapbook (Album Two), p2. Canterbury Museum Collection 2015.115.1
- 22 Margaret Stoddart's painting *Pimelea arenaria* now known

- as *Pimelea villosa* (autetaranga/sand daphne) and *Geranium traversii* (Chatham Island geranium), 22 November 1886, gouache on buff paper, 350 x 270mm. Canterbury Museum Collection 1907.7.75
- 23 Original diary of E R Chudleigh, 20 June 1887. Canterbury Museum Collection 34/49
- 24 1893 Annual Report for Canterbury Museum, Canterbury Museum Archives. Following Sir Julius von Haast's death, the Museum had a lead with the title of Curator instead of Director.
- 25 Canterbury College Museum Committee Minutes, 1874–1890. Macmillan Brown Library, University of Canterbury (REFD 80607). Meeting Monday 28 November 1887: 171. “That two pictures of Chatham Island scenery be purchased from Miss Stoddart at a cost of £5.0.0”.
- 26 Catalogue, Canterbury Society of Art, *Black and White* exhibition, September 1887. 87 (*Beach Scene, CI* and 92) *Moriori Tree Carving*. Christchurch Art Gallery Te Puna o Waiwhetū Archives.
- 27 Canterbury College Museum Committee Minutes, 1874–1890. Macmillan Brown Library, University of Canterbury (REFD 80607). Meeting Monday 23 December 1889. “... Consideration deferred”.
- 28 Canterbury College Museum Committee Minutes, 1874–1890. Macmillan Brown Library, University of Canterbury REFD 80607. Meeting Monday 17 March 1890: 220. “The Curator brought forward the subject of twelve drawings of NZ flowers by Miss Stoddart now in the Museum. It was resolved that these be purchased at a cost of six pounds (£6)”.
- 29 Canterbury Museum Annual Reports, 1907–1948: 31–32. Canterbury Museum Archives.
- 30 Also ‘Director’s Correspondence: Inwards/Outwards’, 1907. Canterbury Museum Archives 2010.172 3/1 Box 1 Folder 9
- 31 Margaret Stoddart scrapbook (Album Two), pp7–20, 25–29. Canterbury Museum Collection 2015.115.1
- 32 See interview with Stoddart in *The Press*, 11 February 1907: 8 where she is quoted talking about flower painting in Europe and how she intends to work on landscapes in New Zealand.
- 33 Canterbury Museum Annual Reports, 1907–1948: 31–32. Canterbury Museum Archives
- 34 Canterbury Museum Annual Report, 1918, under ‘Herbarium’ subheading. Canterbury Museum Archives
- 35 Monochromatic watercolour paintings on paper of ‘Moriori Tree Carving’ (rākau momori – carved trees/dendroglyphs – in the Chatham Islands/Rēkohu/Wharekauri). And ‘*Beach Scene, CI*’ (Moriori Burial Ground, Chatham Islands/Rēkohu/Wharekauri). Both painted by Margaret Olog Stoddart in 1887. Canterbury Museum Collection 1909.27.2 and 1909.27.3
- 36 Margaret Stoddart scrapbook (Album Two). Canterbury Museum Collection 2015.115.1
- 36 Margaret Stoddart Album One. Canterbury Museum Collection 2015.114.1
- 37 1907 Accession Ledger: 73, Canterbury Museum Archives. “Drawings of plants”.

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Catalogue

Mainland New Zealand plants painted prior to Stoddart's first visit to the Chatham Islands



1. *Alectryon excelsum* subsp. *excelsus* (titoki) 'Ti Toki Berries', 1886. Gouache on buff paper, 350 x 270mm. Canterbury Museum 1907.7.10



2. *Herpolirion novae-zelandiae* (sky lily) surrounded by bracken fronds (*Pteridium esculentum*) and a subalpine grass, titled 'Herpolirion Novae Zealandiae' by the artist, 1886. Gouache on buff paper, 350 x 270mm. Canterbury Museum 1907.7.9



3. *Fuchsia procumbens* (creeping fuchsia/tōtara) titled 'Fuchsia Quereus' by the artist, 1886. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.65

Chatham Island plants painted during Stoddart's first visit in 1886–1887



4. *Cyathodes robusta* which is now classified as *Leptecophylla robusta* (pouteretere), 20 July 1886. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.8



5. *Corokia macrocarpa* (hokataka/Chatham Island korokio), 30 July 1886. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.4



6. *Myrsine chathamica* (Chatham Island matipo), 5 August 1886. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.77



7. *Pseudopanax chathamicus* (hoho/Chatham Island lancewood), 20 August 1886. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.6



Rhipogonum scandens, Forst.
North and South Islands, Stewart Island,
Chatham Islands.

8. *Ripogonum scandens* (kareao/supplejack), 31 August 1886. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.63



9. *Solanum aviculare* var. *aviculare* (poroporo) or *Solanum laciniatum* (poroporo), 24 September 1886. Gouache on buff paper, 270 x 370mm. Canterbury Museum 1907.7.37



10. *Sophora* sp. (kōwhai), 24 October 1886. Gouache on buff paper, 270 x 370mm. Canterbury Museum 1907.7.36



11. *Pimelea arenaria* now known as *Pimelea villosa* (autetaranga/sand daphne) and *Geranium traversii* (Chatham Island geranium), 22 November 1886. Gouache on buff paper, 350 x 270mm. Canterbury Museum 1907.7.75



12. *Corynocarpus laevigatus* (kopi/karaka), 23 November 1886. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.64



13. *Senecio huntii* now known as *Brachyglottis huntii* (rautini/Chatham Island Christmas tree), 31 December 1886. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.55



14. *Veronica chathamica* (Chatham Island koromiko) and *Calystegia soldanella* (rauparaha/shore bindweed), 3 January 1887. Gouache on buff paper, 350 x 270mm. Canterbury Museum 1907.7.74



15. *Dracophyllum arboreum* or *D. scoparium* (inaka/turpentine scrub), 5 January 1887. Gouache on buff paper, 195 x 375mm. Canterbury Museum 1907.7.38



16. *Libertia peregrinans* (mikoikoi/New Zealand iris) and *Argentina anserinoides* (silverweed), 7 January 1887. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.31



17. *Epilobium pallidiflorum* (tarawera/swamp willowherb), 18 January 1887. Gouache on buff paper, 155 x 270mm. Canterbury Museum 1907.7.5



18. *Sonchus grandifolius* (pūhā pārākau rahi/Chatham Island sow thistle), 21 January 1887. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.1

Plants painted on Stoddart's return to mainland New Zealand: Oils on paper, dated.



19. *Elaeocarpus dentatus* var. *dentatus* (hīnau) incorrectly identified and historically labelled as *Hedycarya arborea*, 1889, oil on paper, 270 x 360mm. Canterbury Museum 1907.7.40



20. *Clematis marata* (clematis), 1889, oil on paper, 267 x 368mm. Canterbury Museum 1907.7.42



21. *Corokia cotoneaster* (korokio/wire-netting bush), 1889, oil on paper, 368 x 267mm. Canterbury Museum 1907.7.44



22. *Rubus parvus* (creeping lawyer), 1889, oil on paper, 368 x 267mm. Canterbury Museum 1907.7.47



23. *Mesembryanthemum australe* now known as *Disphyma australe* subsp. *australe* (horokaka/New Zealand ice plant), 1889, oil on paper, 368 x 267mm. Canterbury Museum 1907.7.50



24. *Phormium tenax* (harakeke/flax), 1889, oil on paper, 270 x 380mm. Canterbury Museum 1907.7.82



25. *Selliera radicans* (remuremu/half star or bonking grass), 1890, oil on paper, 270 x 380mm. Canterbury Museum 1907.7.83



26. *Hoheria* (houhere/lacebark), 1890, oil on paper, 270 x 350mm. Canterbury Museum 1907.7.84

Oils on paper, undated



27. *Senecio saxifragoides* now known as *Brachyglottis lagopus* (mountain daisy), oil on paper, 270 x 360mm. Canterbury Museum 1907.7.39



28. *Anthericum hookeri* now known as *Bulbinella hookeri*, oil on paper, 267 x 368mm. Canterbury Museum 1907.7.41



29. *Linum monogynum* var. *monogynum* (rauhuia/ New Zealand true flax), oil on paper. In the background are *Pteridium esculentum* (rarahu/bracken) at left and *Ficinia nodosa* (wīwi/knobby club rush) to the right, 267 x 368mm. Canterbury Museum 1907.7.43



30. *Celmisia verbascifolia* (mountain daisy), oil on paper, 267 x 368mm. Canterbury Museum 1907.7.45



31. *Mazus radicans* (swamp musk) foreground, oil on paper, *Ficinia nodosa* (wīwī/knobby club rush), *Carex flagellifera* (mānaia/Glen Murray tussock) and *Pteridium esculentum* (rārahu/bracken) left to right in the background, 267 x 368mm. Canterbury Museum 1907.7.46



32. *Clematis afoliata* (leafless clematis), oil on paper, 267 x 368mm. Canterbury Museum 1907.7.48



33. *Libertia ixioides* (mikoikoi/New Zealand iris), oil on paper, 267 x 368mm. Canterbury Museum 1907.7.49



34. *Leptospermum scoparium* var. *scoparium* (mānuka), oil on paper, 267 x 368mm. Canterbury Museum 1907.7.51



35. *Clematis foetida* (pöhuehue/clematis), oil on paper, 250 x 270mm. Canterbury Museum 1907.7.85

Gouache work, dated



36. *Libertia grandiflora* (mikoikoi/ New Zealand iris), 1890. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.30



37. *Muehlenbeckia axillaris* (creeping pōhuehue), 2 December 1890. Gouache on buff paper, 270 x 190mm. Canterbury Museum 1907.7.81



38. *Bulbinella gibbsii* (Māori onion), 6 December 1890. Gouache on buff paper, 270 x 370mm. Canterbury Museum 1907.7.35



39. *Hoheria lyallii* (mountain lacebark), 31 December 1890. Gouache on buff paper, 375 x 270mm. Canterbury Museum 1907.7.29



40. *Senecio hectorii* now known as *Brachyglottis hectorii* (kohuhurangi/Hector's tree daisy), 1891. Gouache on buff paper, 350 x 270mm. Canterbury Museum 1907.7.12



41. *Solanum aviculare* (poroporo), 1891. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.57



42. *Rubus australis* (Tātārāmoa/bush lawyer), 22 January 1891. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.52



43. *Callixene parviflora* now known as *Luzuriaga parviflora* (nohi/lantern berry), 30 January 1891. Gouache on buff paper, 350 x 270mm. Canterbury Museum 1907.7.11



44. *Hoheria augustifolia* (houhere/narrow-leaved lacebark), 31 January 1891. Gouache on buff paper, 350 x 270mm. Canterbury Museum 1907.7.2



45. *Euphrasia* (eyebright) and other plants, 1893. Gouache on buff paper, 350 x 270mm. Canterbury Museum 1907.7.56



46. *Viola filicaulis* (forest violet) and other plants, 13 November 1893. Gouache on buff paper, 350 x 270mm. Canterbury Museum 1907.7.70



47. Rare yellow form of *Metrosideros lucida* now known as *Metrosideros umbellata* (southern rātā), 4 January 1894. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.58



48. *Earina autumnalis* (raupeka/Easter orchid), 13 February 1894. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.25



49. *Myrtus bullata* now known as *Lophomyrtus bullata* (ramarama), 19 February 1894. Gouache on buff paper, 270 x 375mm. Canterbury Museum 1907.7.33



50. *Senecio sciadophilus* now known as *Brachyglottis sciadophila* (climbing groundsel), 22 February 1894. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.26



51. *Cyathodes acerosa* now known as *Leptecophylla juniperina* subsp. *juniperina* (prickly mingimingi), 27 February 1894. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.59



52. *Veronica hulkeana* (New Zealand lilac), 12 November 1895. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.13



53. *Gentiana corymbifera* now known as *Gentianella corymbifera* subsp. *corymbifera* (grassland gentian), 29 April 1896. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.76



54. *Pseudopanax colensoi* var. *colensoi* (orihou/mountain five finger) or *Pseudopanax arboreus* (whauwhaupaka/five finger), 26 June 1896. Gouache on buff paper, 270 x 375mm. Canterbury Museum 1907.7.34



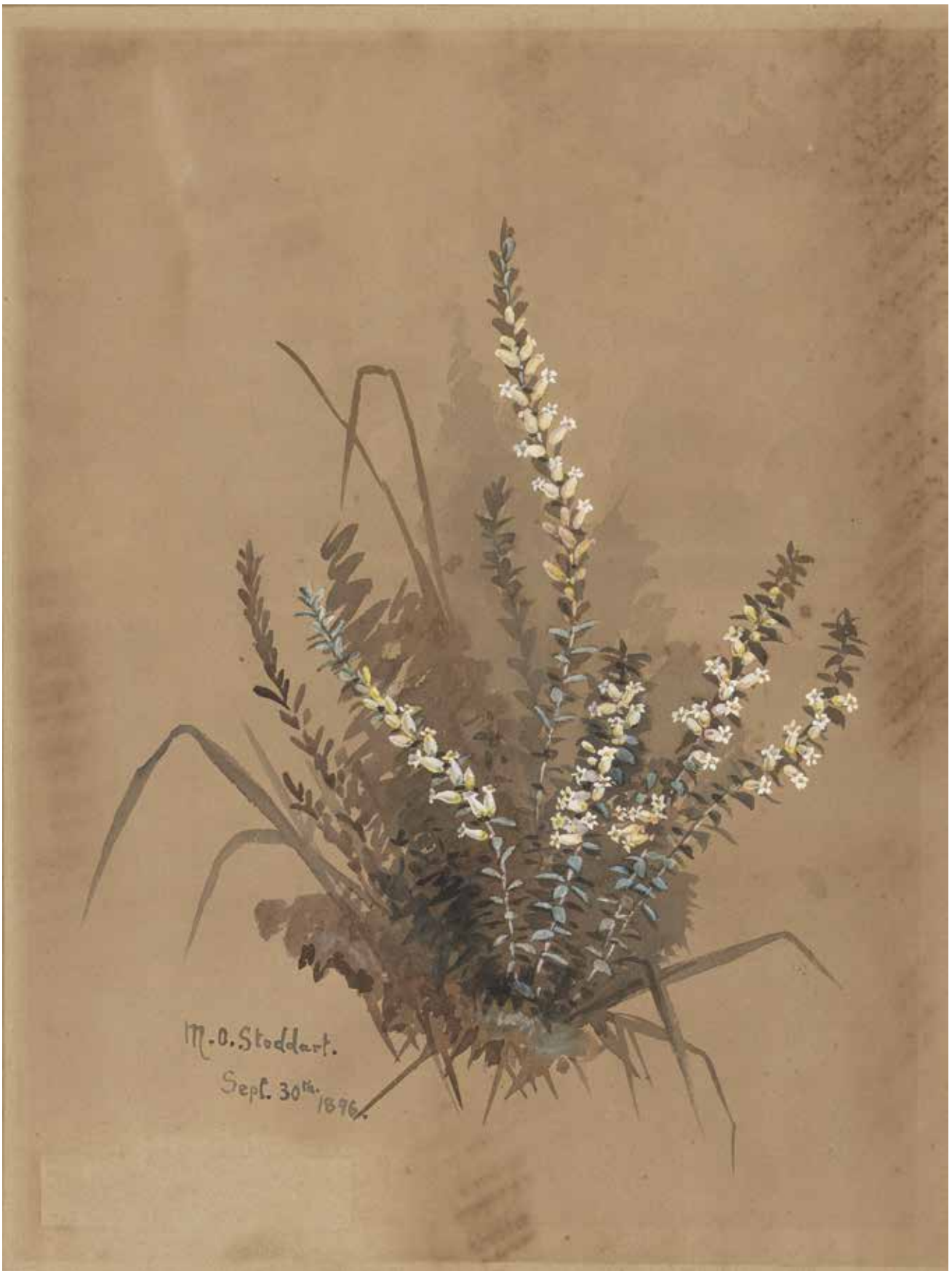
55. *Clematis afoliata* (leafless clematis), 21 September 1896. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.67



56. *Fuchsia excorticata* (kotukutuku/tree fuchsia), 26 September 1896. Gouache on buff paper, 350 x 270mm. Canterbury Museum 1907.7.69



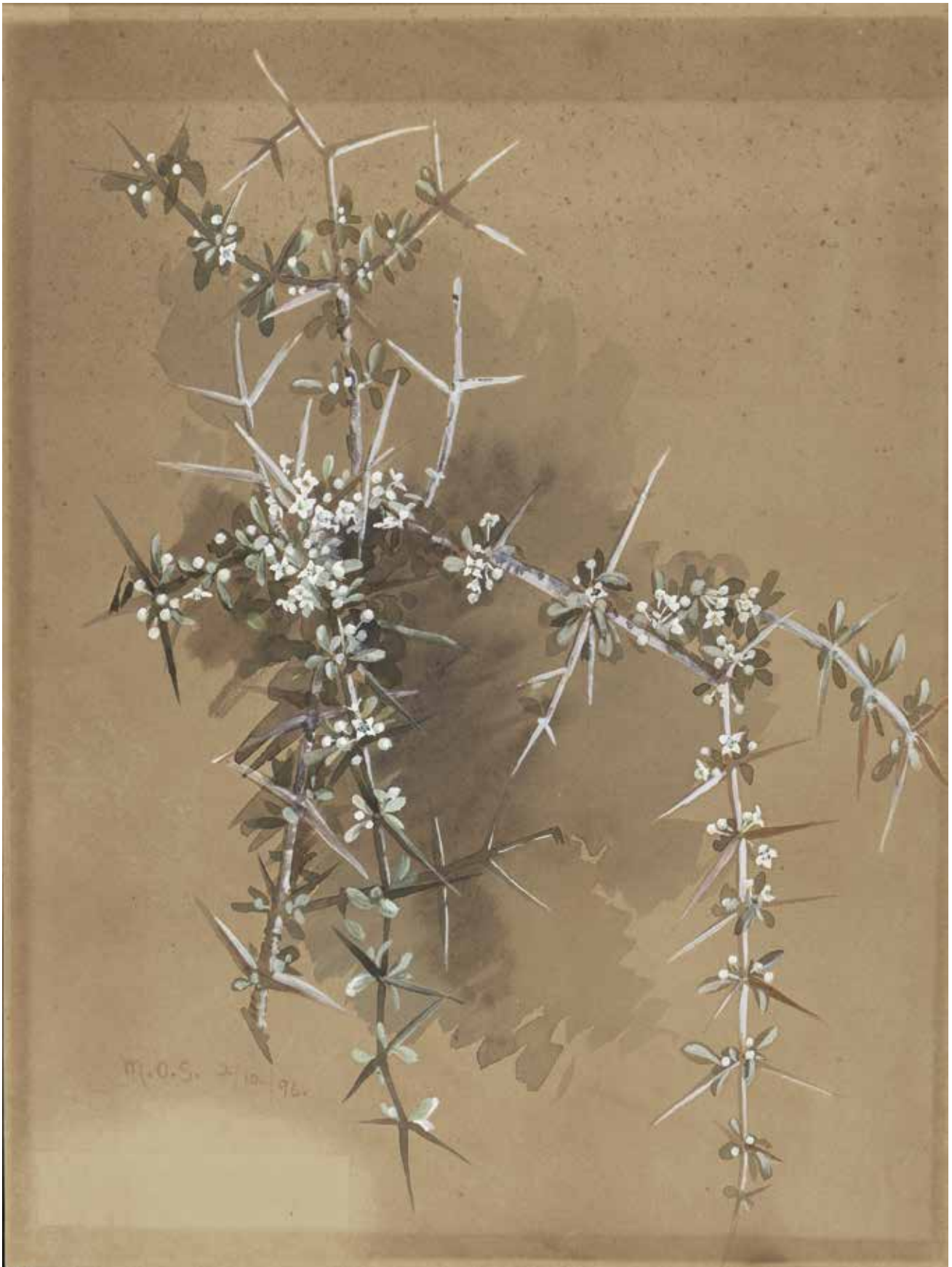
57. *Geranium* sp. (cranesbill), 30 September 1896. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.54



58. *Cyathodes fraseri* which is now known as *Leucopogon fraseri* (pātōtara/dwarf mingimingi), 30 September 1896. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.14



59. *Brachycome sinclairii* (grassland daisy), 10 October 1896. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.53



60. *Discaria toumatou* (matagouri), 2 October 1896. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.15



61. *Pittosporum tenuifolium* (kohukohu/black matipo), 3 November 1896. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.71



62. *Celmisia gracilentata* or *Celmisia alpina* (mountain daisy), 11 November 1896. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.18



63. Most likely *Thelymitra longifolia* (mäikuku/white sun orchid), 18 November 1896. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.80



64. *Geum cockaynei* (Cockayne's geum), 11 December 1896. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.19



65. *Arthropodium cirratum* (rengarenga/rock lily), 21 December 1896. Gouache on buff paper, 265 x 375mm. Canterbury Museum 1907.7.20



66. *Ourisia macrocarpa* var. *calycina*, now named *Ourisia calycina* (snowy mountain foxglove), 23 December 1896. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.16



67. *Veronica salicifolia* (koromiko/hebe), 26 December 1896. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.17



68. *Parsonsia capsularis* (kaiwhiria/New Zealand jasmine), 1897. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.68



69. *Celmisia semicordata* (large mountain daisy), 5 January 1897. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.24



70. *Melicytus ramiflorus* (māhoe/whitey wood), March 1897. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.60



71. *Coprosma* sp. 9 March 1897. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.21



72. This form of *Wahlenbergia gracilis* is now known as *Wahlenbergia violacea* (rimuroa/violet harebell), 18 March 1897. Gouache on buff paper, 270 x 370mm. Canterbury Museum 1907.7.22



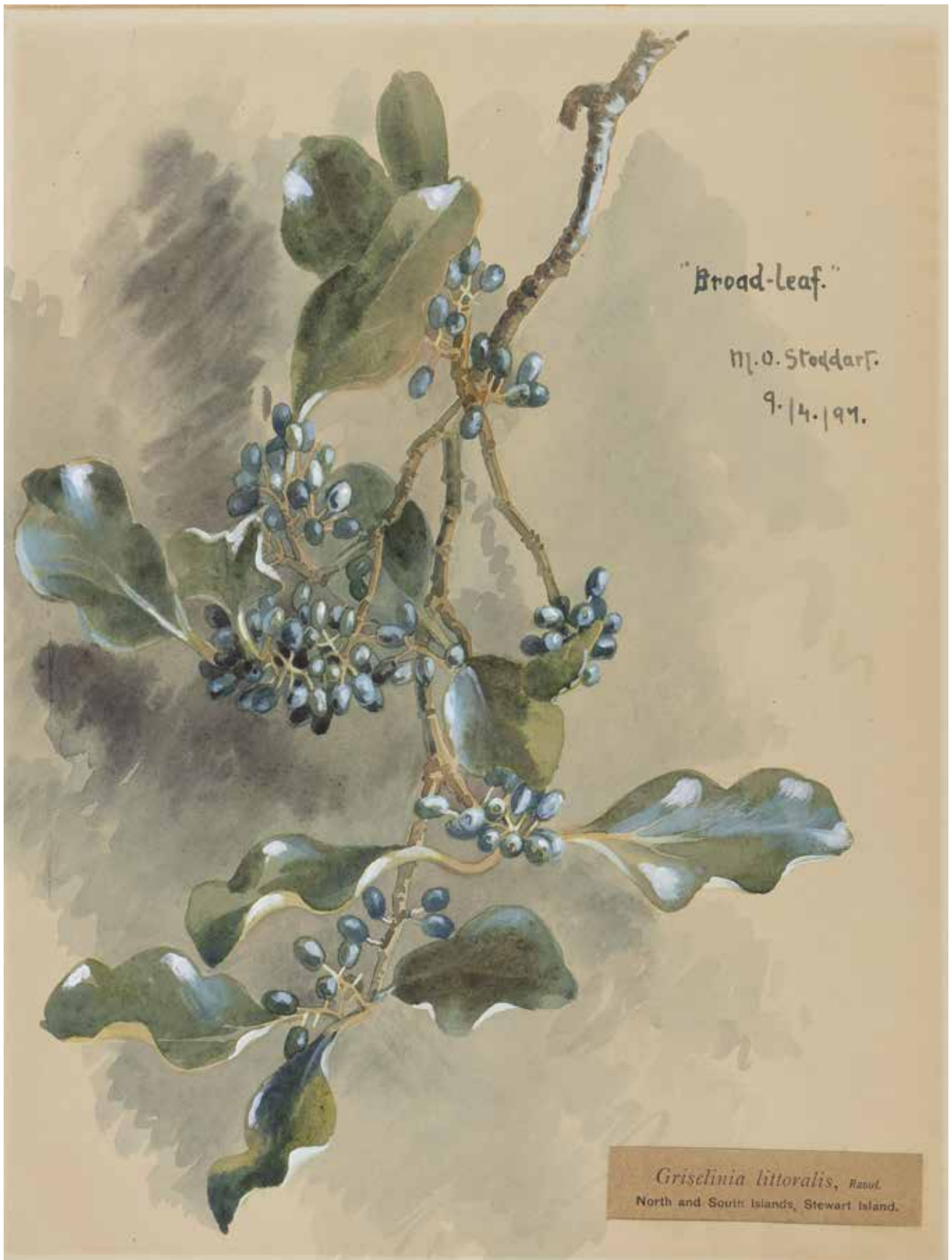
73. *Corokia cotoneaster* (korokio), 22 March 1897. Gouache on buff paper, 350 x 270mm. Canterbury Museum 1907.7.79



74. *Rubus cissoides* (tātārāmoa/bush lawyer), 1 April 1897, gouache on buff paper, 270 x 375mm. Canterbury Museum 1907.7.3



75. Most likely *Senecio quadridentatus* (pahokoraka/cotton fireweed), 6 April 1897. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.72



76. 'Broad-Leaf' *Griselinia littoralis* (kāpuka/broadleaf), 9 April 1897. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.61



77. *Tupeia antarctica* (tāpia/white mistletoe), 23 April 1897. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.62



78. *Passiflora tetrandra* (kohia/New Zealand passionflower/passionfruit), 27 April 1897. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.32



79. *Parsonsia heterophylla* (kaihua/New Zealand jasmine), 22 November 1897. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.66



80. *Mesembryanthemum australe* now known as *Disphyma australe* subsp. *australe* (horokaka/New Zealand ice plant), 7 December 1897. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.23



81. *Myoporum laetum* (ngaio), 11 December 1897. Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.777

Gouache works, undated



82. *Metrosideros diffusa* or *Metrosideros perforata* (white rātā). Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.27



83. *Thelymitra* spp. and *Gentianella spenceri* (Spencer's gentian). Gouache on buff paper, 270 x 370mm. Canterbury Museum 1907.7.28



84. Probably *Coprosma propinqua* var. *propinqua* × *Coprosma robusta* hybrid (tāpātāpā × karamū). Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.73



85. *Celmisia gracilentata* or *Celmisia alpina* (mountain daisy). Gouache on buff paper, 270 x 350mm. Canterbury Museum 1907.7.78

Nesameletus staniczeki, a New Species of *Nesameletus* (Ephemeroptera: Nesameletidae) from New Zealand

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A new species of endemic mayfly from the genus *Nesameletus* is described from the South Island of Aotearoa New Zealand. The adult, subimago and larval stages of *Nesameletus staniczeki* sp. nov. are described and a distribution map of known localities is provided. General habitat information of the species and an updated key for *Nesameletus* is provided. Diagnostic characters of the genus are provided with reference to the classification of the Nesameletidae.

Keywords: Aotearoa New Zealand, Ephemeroptera, identification key, *Nesameletus*, taxonomy

Introduction

The family Nesameletidae is of southern hemisphere distribution and includes the following three genera: *Ameletoides* Tillyard, 1933 from Australia, *Metamonius* Eaton, 1885 from South America and *Nesameletus* Tillyard, 1933 from Aotearoa New Zealand. *Nesameletus* was revised by Hitchings and Staniczek (2003) and three new species were described. Five species of *Nesameletus* are presently described and at least one undescribed species is known from Fiordland (see Grainger et al. 2018; Pohe 2019). Canterbury Museum mayfly collection data are published to data aggregators, the Atlas of Living Australia (ALA) and the Global Biodiversity Information Facility (Canterbury Museum 2021). This paper describes another species, *Nesameletus staniczeki* sp. nov., known from inland Canterbury and the West Coast of the South Island.

Materials, Methods and Conventions

Larvae were associated with adults by proximity and by rearing. Specimens, including the type specimens, are stored in 80% ethanol. All material examined is deposited at Canterbury Museum, Christchurch, New Zealand (CMNZ), and provided with an accession number prefixed with CMNZ followed by a tripartite number separated by a period in parentheses.

All body and wing measurements are in millimetres (mm) and presented as a range with means in parentheses. Length ratios of foreleg segments (femur: tibia: tarsomeres 1–5) are based on absolute lengths (mm) of tibia.

Collecting sites follow the abbreviated geographical regional codes of Crosby et al. (1998). Regions referred to in this paper are as follows: MB, Marlborough; KA, Kaikōura; BR, Buller; NC, North Canterbury; MC, Mid Canterbury; SC, South Canterbury; MK, Mackenzie; WD, Westland. The abbreviation APNP refers to Arthur's Pass National

Park. Map references are given as latitude and longitude in decimal degrees (Geodetic Datum: WGS84). Altitudes are given in metres (m) above sea level.

Abbreviations of collection sites of material examined are given: Ck – creek; R – river; Stm – stream; Trib – tributary. Abbreviations of collectors: TRH – Tim R Hitchings; SFW – Simon F Watson; RH – Richard Hitchings; TH – Terry Hitchings; GT – Gillie Temm.

Abbreviations for taxonomic features shown in figures are given here: pe – penis; sty – styliger; stp – styliger plate; tf – terminal filament; ce – cerci; spg – subgenital plate; str – sternite; clp – clypeus; lbr – labrum; inc – incisor; prtc – prostheca; mlrsrf – molar surface; galc – galeolacinia; pmx – maxillary palp; gl – glossa; pgl – paraglossa; plb – labial palp; prmt – prementum; pmt – postmentum.

Systematics

Order: Ephemeroptera Hyatt and Arms, 1891

Family: Nesameletidae Kluge et al., 1995

Genus: *Nesameletus* Tillyard, 1933 as diagnosed by Hitchings and Staniczek (2003): 15–18

Keys to *Nesameletus* species at Imago and Larva life stages

Keys to the imago and larva life stages of *Nesameletus* presented here are modified from Hitchings and Staniczek (2003) to include *Nesameletus staniczeki* sp. nov.

Imago

- 1 Forewing in its distal ½ with pterostigmatic region without clustering of crossveins between Sc and R₁ 2
Forewing in its distal ½ with pterostigmatic region showing clustering of crossveins between Sc and R₁ 4
- 2 Bullae of forewing surrounded by dark blotches of pigmentation and thus conspicuous 3
Bullae of forewing without blotches of pigmentation and thus inconspicuous, first femur with a dark band *austrinus*
- 3 In male, penis separated by a narrow v shaped margin at mid length. Stripe of pigmentation centrally along each penis, first femur without a dark band *vulcanus*
In male, penis separated by wide v shaped notch at mid length. Dark brown pigmentation at lateral and apical margins, first femur with a darkening at mid length *staniczeki*
- 4 Clustered crossveins in the pterostigmatic region of forewing between R₁ and R₂ thinner than crossveins between Sc and R₁ *ornatus*
Clustered crossveins in the pterostigmatic region of forewing between R₁ and R₂ at least as thick as crossveins between Sc and R₁ 5
- 5 Pterostigmatic region of forewing tinted reddish; crossveins between C and Sc in this region reticulated *murihiku*
Pterostigmatic region of forewing neither tinted reddish nor with many reticulated crossveins *flavitinctus*

***Nesameletus staniczeki* sp. nov.**

Description: Measurements (mm). Male imago (single specimen): length of body 16.4; forewing 16.1; hindwing 7.2. Female imago (n = 6): body length 14.3–17.4 (15.8); forewing 15.5–16.9 (16.6); hind wing 5.6–7.7 (6.7). Male mature larva (n = 10): body length 12.0–15.0 (13.8). Female mature larva (n = 3): body length 14.6–16.5 (15.4).

Male imago: Head. Pale grey, ocelli whitish, dark brown to blackish at bases, eyes grey, darker below, antennal scape pale grey. Thorax. Pronotum pale yellowish grey with paired paler marks at anterior margin, darker at lateral margins; notum generally greyish white with fine pale longitudinal centreline; distal margin pale grey, extended and with paired dark brown maculae. Pleura yellowish grey with dark brown margins. Thoracic sterna reddish white. Legs. Generally pale yellowish white; first femur slightly darker at mid length; first tibiae and tarsi dark brown; articulation of the femora with tibiae and subsequent tarsal joints darker. Length ratios of the foreleg segments: 1.00: 0.85: 0.27: 0.46: 0.38: 0.35: 0.23. Wings. Forewing (Fig. 1A). Width 0.31 x length. Forewing cells C and Sc translucent, faintly brownish apically, otherwise hyaline. All veins brown with thickening diminishing from costa to dorsum. In the pterostigmatic region each row of crossveins between Sc, R₁

Late instar larva

- 1 Abdominal ganglia strongly pigmented and thus well visible through sterna of segments III–VIII *austrinus*
Abdominal ganglia at most pigmented on sterna 5–8 2
- 2 Posterior borders of abdominal terga 8–9 only with transverse row of spines present (small number of spines present on terga 7 sometimes) 3
Posterior borders of abdominal terga 5–9 at least with well-developed transverse row of spines present 4
- 3 Posterior borders of abdominal terga 8 and 9 only with well-developed transverse row of spines. Dorsal abdomen with larger white maculae along midline, giving appearance of a continuous pale line *vulcanus*
Posterior borders of abdominal terga 8 and 9 with irregular transverse row of spines. Dorsal abdomen with smaller white maculae along midline that does not give appearance of a continuous pale line *staniczeki*
- 4 Without dark patches or longitudinal marks on femur I *murihiku*
With dark patches or longitudinal marks on femur I 5
- 5 Caudal filaments with distinct dark medial band; labium with several stout spines on postmentum shoulder *ornatus*
Caudal filaments rarely with distinct dark medial band; labium without stout spines on postmentum shoulder *flavitinctus*

and R₂ similarly spaced; little reticulation between C and Sc only. The Sc and R₂ bullae ampoule-like, with dark brown cell wall and paler brownish clouding within. Third and fourth bullae may be visible on veins R₄₊₅ and at the fork of M, approximately in line with the others, but without clearly defined cell walls. Both veins R_{3a} and R_{3b} basally connected. Hindwing (Fig. 1B). Width 0.51 x length and length 0.43 x that of forewing, as described for the genus (Hitchings and Staniczek 2003). Abdomen (Fig. 2). Terga each faintly brownish with a slightly darker longitudinal centre line. A transverse posterior dark brownish band on all segments. Tergum 9 paler. Sterna greyish brown, dark brown abdominal ganglia visible on sternum 8 and sometimes 7. Genitalia (Fig. 3A and 3B). Penes greyish brown, fused, then separated at mid length by a wide v-shaped notch. The apex of each penis further extended laterally, rounded and darkened on lateral and apical margins. Styliiger plate with a wide v-shaped emargination and rounded apices. In lateral view each penis tapering to a rounded apex, without appendages and indented slightly at mid length. Caudal filaments yellowish white, each annulation darker distally.

Female imago: As in the male except as follows: Eyes blackish grey, head pale grey. Thorax. As for male. Legs. Tibiae and

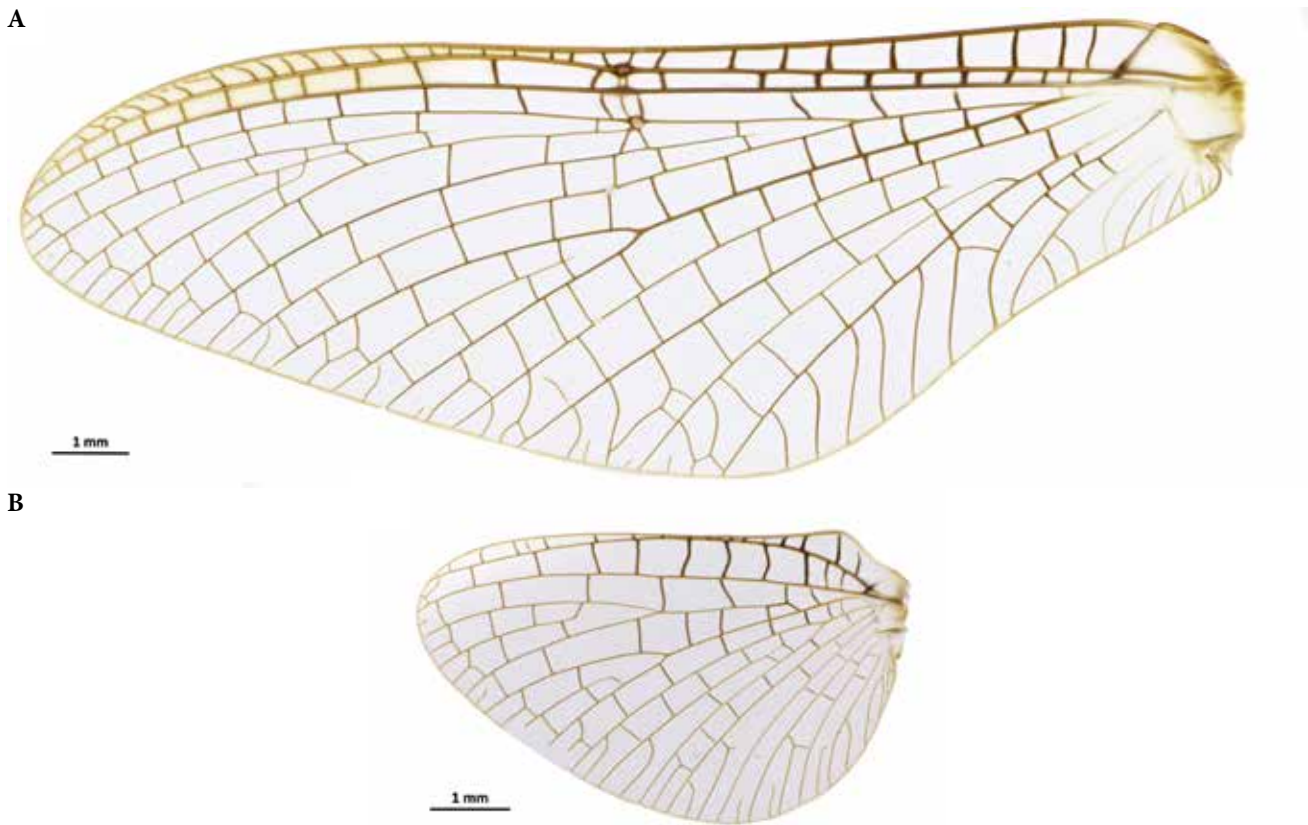


Figure 1. Forewing (A) and hindwing (B) of male imago

tarsi similar to femora but with each segment darkening distally. Wings. Forewing: Width 0.36 x length. Hindwing: width 0.53 x length and length 0.37 x that of forewing. Forewings brownish apically almost without reticulation in cells C and Sc. Bullae clouded and present on veins Sc, R₁ and R₂ as in the male imago. Abdomen as for male, except: terga with darker longitudinal centreline marked on segments 7–9. Sterna and abdominal maculae as in male. Genitalia (Fig. 4A and 4B). Sternum 7 with triangular subgenital plate extending about one quarter the length of sternum 8. Sternum 9 with v-shaped, basally rounded emargination and rounded apices.

Female subimago: As in the imago except as follows: Eyes of the male and female greyish black. Anterior portion of the lateral scutal suture washed with dark brown. Scutum and scutellum whitish. Pleura and sterna whitish with margins brownish. Posterior extension of metanotum

with paired parallel brownish marks. Abdominal terga 1–8 pale brownish, each with dark brown posterior transverse bands. Tergum 9 whitish. Sterna whitish with a macula well marked on sternum 7 but less so on the other segments. Wings. Forewing (Fig. 5A): membranes translucent; longitudinal and crossveins dark brown; faint clouding at crossveins, most noticeable near the bullae. Hindwings (Fig. 5B): membranes also translucent with brownish veins.

Late instar larva (Fig. 6): Head. Dorsal head, thorax and abdomen with an almost uniformly greyish brown background; clypeus whitish, darker brown at basal margin; labrum blackish at lateral margins; antennae yellowish brown, half the length of head. Eyes: greyish black. Mouthparts. Clypeus and labrum (Fig. 7): length: 0.83–0.94 (0.89) x as long as and width 0.72–0.82 (0.77) x as wide as clypeus. Right mandible (Fig. 8A): well-worn; inc surface with about 12 parallel cuticular serrated ridges. Maxilla



Figure 2. Dorsal view of abdomen of male imago

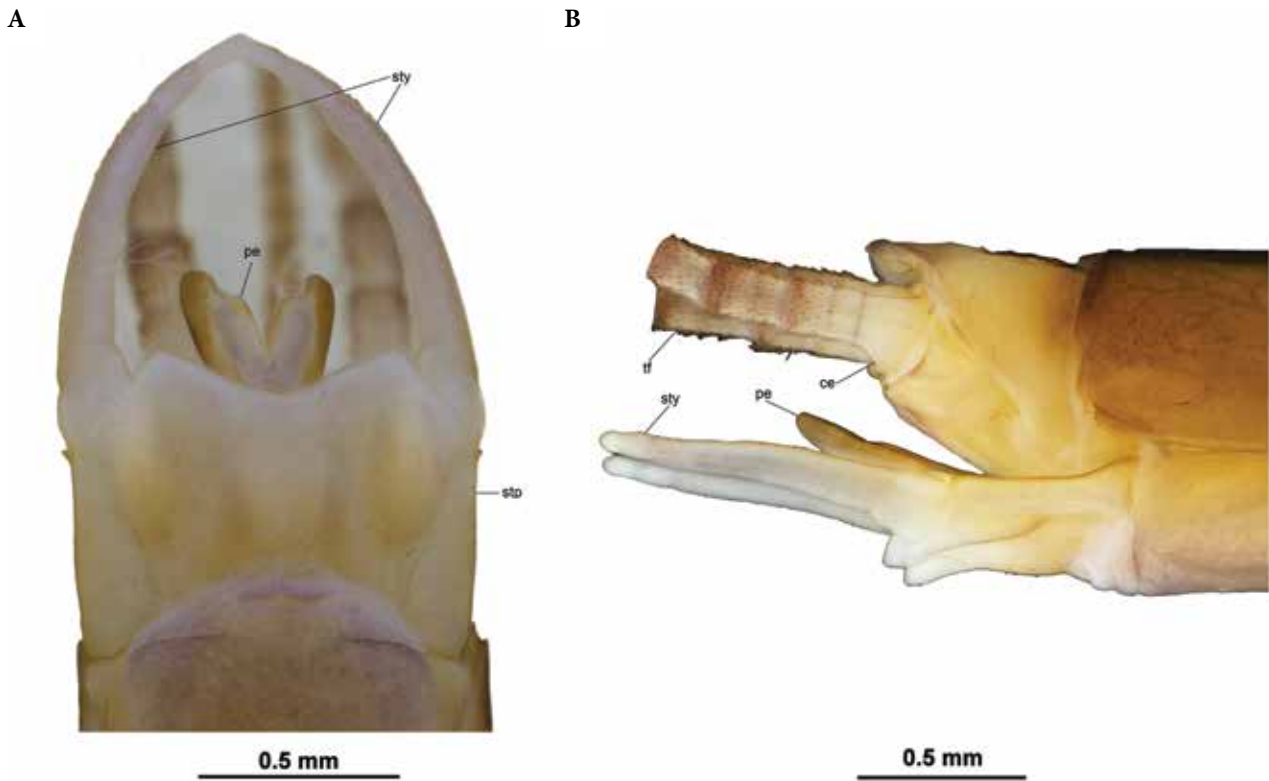


Figure 3. Ventral view (A) and lateral view (B) of male genitalia

(Fig. 8B): right maxilla lacinia with marginal row of 15 larger spines directed medioventrally; posterior submarginal row of 4 setae and basal row of 5 setae. Palp segment 2, 0.85 x as long as segment 1; segment 3 0.23 x as long as segment 1. Labium (Fig. 9A and 9B): aboral surface of prementum with a paired group of 0–2 thick spines. Palp segment 2, 0.67 x as long as segment 1; segment 3, 0.80 x as long as segment 2. Dorsal thorax: greyish brown, darker at the anterior and lateral margins; mesonotum and metanotum each with a narrow whitish central longitudinal band. Scutellum with paired oval darker brownish marks. Pleura pale brown, darker ventrally. Dorsal abdomen (Fig. 6): greyish white,

dark brown at posterior margins. Dorsal abdominal segments 1–9 with paired whitish lateral maculae and smaller oval whitish maculae in the midline; segments 2–9 with paired brownish parasagittal marks, those on segment 8 most strongly contrasted against a whitish background. A few small and irregularly developed posterior spines directed caudally on tergite 9 and occasionally tergite 8. Ventral abdomen (Fig. 6): sterna whitish, each without or with only weakly developed irregular posterior transverse spines directed caudally. Abdominal ganglia usually strongly pigmented on sternum 8, less so on 7. Remaining ganglia variably visible. Posterolateral projections small on segments 2–9 but acuminate only on segments 8–9, as in *N. vulcanus*. Legs: greyish brown, generally without dark maculae at mid length of femur but sometimes with indistinct prolateral darkening, and at the tarsal articulations. Tarsal claws yellowish brown with two rows of 10–12 denticles on inner margins. Gills and legs as described for the genus (Hitchings and Staniczek 2003). Caudal filaments: yellowish and lack a distinct dark medial band, 0.41–0.42 x as long as body.

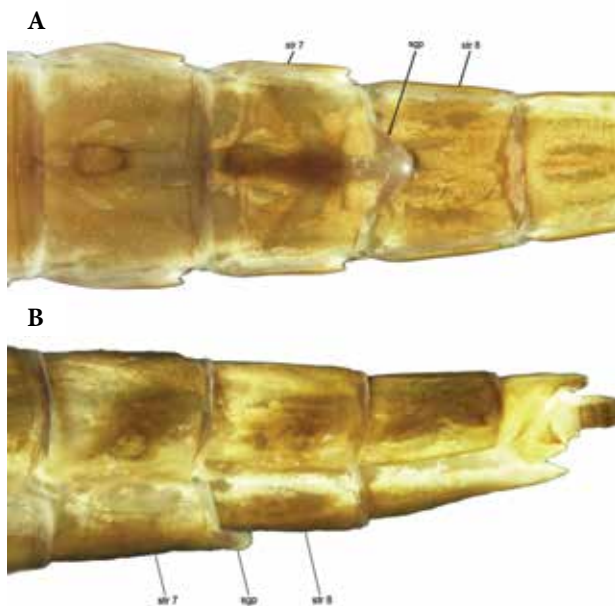


Figure 4. Ventral view (A) and lateral view (B) of female genitalia

Holotype: Male imago (reared), SC, Rata Stm, Peel Forest, -43.896, 171.229, 416 m, 4 October 2020, TRH (CMNZ 2022.38.1).

Allotype: Female imago (reared), SC, Rata Stm, Peel Forest, -43.896, 171.229, 416 m, 4 October 2020, TRH (CMNZ 2022.38.2).

Paratypes: 2 female imagoes (reared), SC, Rata Stm, Peel Forest, -43.896, 171.229, 416 m, 4 October 2020, TRH (CMNZ 2022.38.3, CMNZ 2022.38.4); 1 female subimago (reared), SC, Rata Stm, Peel Forest, -43.897, 171.22959, 415

A



B

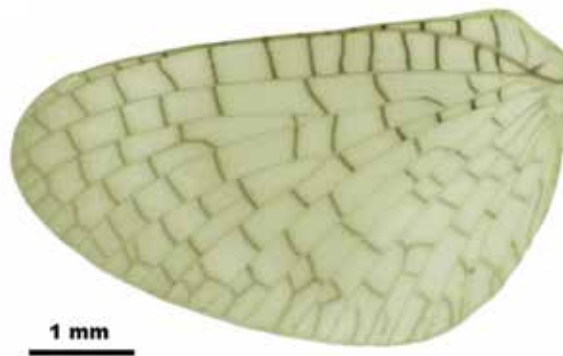


Figure 5. Forewing (A) and hindwing (B) of female subimago



Figure 6. Dorsal and ventral view of late instar larva (cerci truncated)

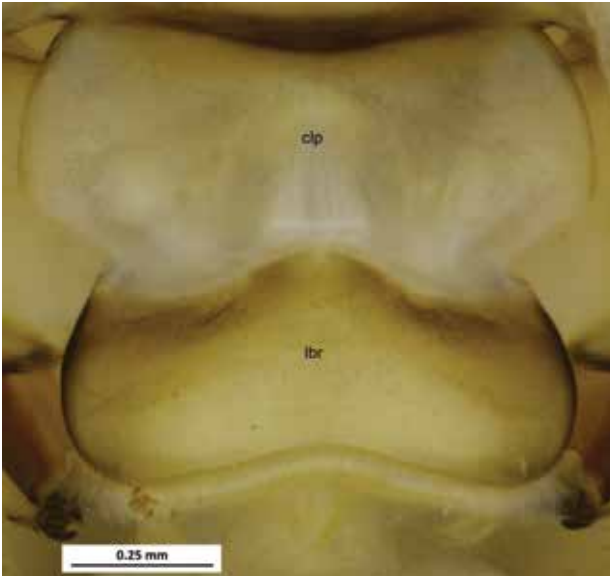


Figure 7. Dorsal view of clypeus and labrum of larva

m, 2 February 2021, TRH (CMNZ 2022.38.5); 1 larva, SC, Rata Stm, -43.897, 171.23, 415 m, 2 February 2021, TRH (CMNZ 2022.38.6); 3 larvae, NC, Tarn Col, Otaheke R, Trib, -42.889, 171.690, 1,370 m, 26 April 2003, SFW (CMNZ 2022.38.7 – CMNZ 2022.38.9); 1 larva, NC, Waimakariri R Trib, -42.917, 171.488, 1283 m, 21 October 2018, TRH and RH (CMNZ 2022.38.10).

Other material examined: 1 larva, MC, Camp Ck, -43.140, 171.702, 1,300 m, 31 December 1997, TH (CMNZ 2022.38.11); 1 larva, Craigieburn -43.1116, 171.7085, 1200 m, 19 February 1999, TH (CMNZ 2022.38.12); 1 larva, MC, Ryton R, Trib, -43.215, 171.607, 1050 m, 26 January 1996, TH (CMNZ 2022.38.13); 1 larva, Ryton R, Trib, -43.197, 171.607, 1470 m, 26 January 1996, TH (CMNZ 2022.38.14); 1 larva, NC, Broken R, -43.132, 171.691, 1113 m, 6 February 2018, TRH (CMNZ 2022.38.15); 1 larva, NC, Bealey R, Trib, -42.914, 171.547, 940 m, 15 January 2006, TH (CMNZ 2022.38.16); 4 larvae, NC, Twin Falls Stm, -42.897, 171.718, 1079 m, 23 November 2012, TRH (CMNZ 2022.38.17–CMNZ

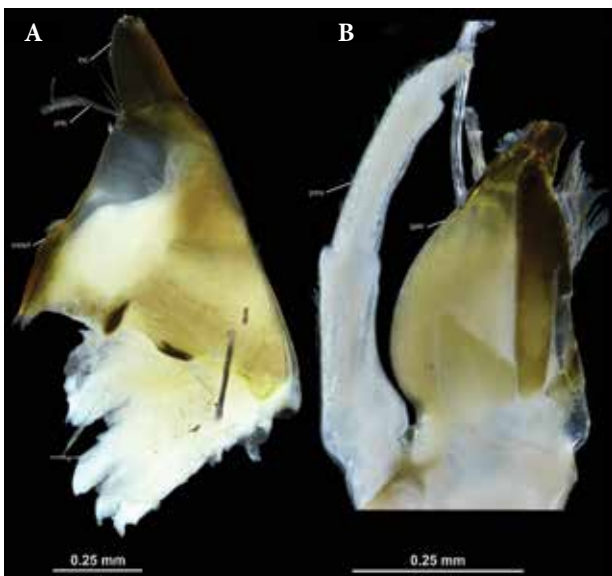


Figure 8. Right mandible (A) and right maxilla (B) of larva

2022.38.20); 3 larvae final instar female, SC, Rata Stm, Peel Forest, -43.896, 171.229, 416 m, 4 October 2020, TRH (CMNZ 2022.38.21–CMNZ 2022.38.23); 2 female imagoes (reared), SC, Rata Stm, -43.896, 171.229, 416 m, 6 February 2021, TRH (CMNZ 2022.38.24, CMNZ 2022.38.25); 1 female imago (reared), SC, Rata Stm, Peel Forest, -43.896, 171.229, 416 m, 4 October 2020, TRH (CMNZ 2022.38.26); 2 larvae, SC, Rata Stm, -43.897, 171.230, 415 m, 2 February 2020, TRH (CMNZ 2022.38.27, CMNZ 2022.38.28); 2 larvae, MC, Twin Ck, headwaters, -42.909, 171.579, 1390 m, 18 February 1999, TH (CMNZ 2022.38.29, CMNZ 2022.38.30); 3 larvae, WD, Hunts Ck, at hut, -42.841, 171.5025, 880 m, 12 November 2005, SFW, GT (CMNZ 2022.38.31–CMNZ 2022.38.33); 1 larva, WD, Otira R, Trib, -42.897, 171.544, 980 m, 14 Jan 2006, TH (CMNZ 2022.38.34); 3 larva, SC, Emily Stm, Peel Forest, -43.897, 171.226, 416 m, 27 October 2019, TRH (CMNZ 2022.38.35–CMNZ 2022.38.37).

Material on slides: NC, Tarn Col, Otehaeke R, Trib, APNP, -42.889, 171.690, 1370 m, 26 April 2003, SFW, (1) Gills. (2) Labium. (3) Mandibles. (4) Maxillae (four slides from three specimens CMNZ 2022.38.7–CMNZ 2022.38.9); NC, Sudden Valley, APNP, -42.962, 171.686, 1360 m, 20 December 2003, SFW, (1) Labium. (2) Labrum, hypopharynx. (3) Mandibles. (4) Maxillae. (5) Larval gills (five slides from one specimen CMNZ 2014.2.47419).

Distribution and habitat: The distribution of collection sites for *N. staniczeki* covers inland Canterbury and the West Coast of the South Island (Fig. 10). *Nesameletus staniczeki* has a distribution in streams and rivers ranging through the central region of the Southern Alps, including Peel Forest, Rangitata River, Arthur's Pass National Park and Westland. Larvae were collected mostly from the slower flowing areas of steep and unstable forested and open first and second order streams, predominantly above 900 m (range 415–1470 m).

Throughout its range, *N. staniczeki* is sympatric with *N.*



Figure 9. Labium of larva; left = dorsal view, right = ventral view

austrinus, *N. cf. vulcanus*, *N. ornatus* and *N. flavitinctus* (Pohe 2019; GBIF.org 2022). *Nesameletus ornatus* and *N. flavitinctus* are widely distributed and often found locally abundant on both main islands of Aotearoa New Zealand. The remaining species appear to be restricted to the South Island. *Nesameletus austrinus* is widespread in the central mountainous region, *N. murihiku* seems to be confined to the southern South Island and Stewart Island. *Nesameletus vulcanus* is currently known from Banks Peninsula, with recent records of *N. cf. vulcanus* collected from the central South Island around the Arthur's Pass area. Populations of *N. staniczeki* appear to be smaller as they are collected less frequently than other congeneric species.

Differential Diagnosis and Discussion

Nesameletus Tillyard, 1933 as diagnosed by Hitchings and Staniczek (2003): 15–18, except that in the male imago the styliiger plate may be deeply emarginated, and in the female imago, sternum 7 has a subgenital plate, which may sometimes extend to almost half the length of sternum 9.

In terms of the phylogenetic characters proposed by Hitchings and Staniczek (2003), *Nesameletus staniczeki* appears to have a sister group relationship with *N. austrinus* and *N. vulcanus*. Thus in the forewing there is an absence, or almost complete absence of, a cluster of crossveins between Sc , R_1 and R_2 in the apical half; veins R_{3A} and R_{3B} are basally

connected. The crossvein thickening is absent between R_1 and R_2 . In the subimago, forewings lack darkened diagonal bands.

In their revision of the genus *Metamoni* Eaton, 1885, Mercado and Elliott (2004) drew attention to diagnostic characters for that genus given in Dominguez et al. (1994). All the characters given by Dominguez et al. (1994) are also shown by *Nesameletus*. Anastomosis of the apical costal region of the forewing is also usually shown by *N. murihiku* and sometimes to a lesser extent by *N. austrinus* and *N. vulcanus*.

Nesameletus staniczeki most resembles *N. vulcanus* and *N. austrinus*. Features that distinguish the three species from each other are summarised in Table 1 (imago) and Table 2 (larva) (p 178). An identification key is provided above. Additional distinctive larval characters of *Nesameletus* species are described and illustrated with drawings and photographs in Hitchings and Staniczek (2003).

Etymology: This species has been named to recognise the valued contribution to the taxonomy of the Nesameletidae made by Arnold H Staniczek.

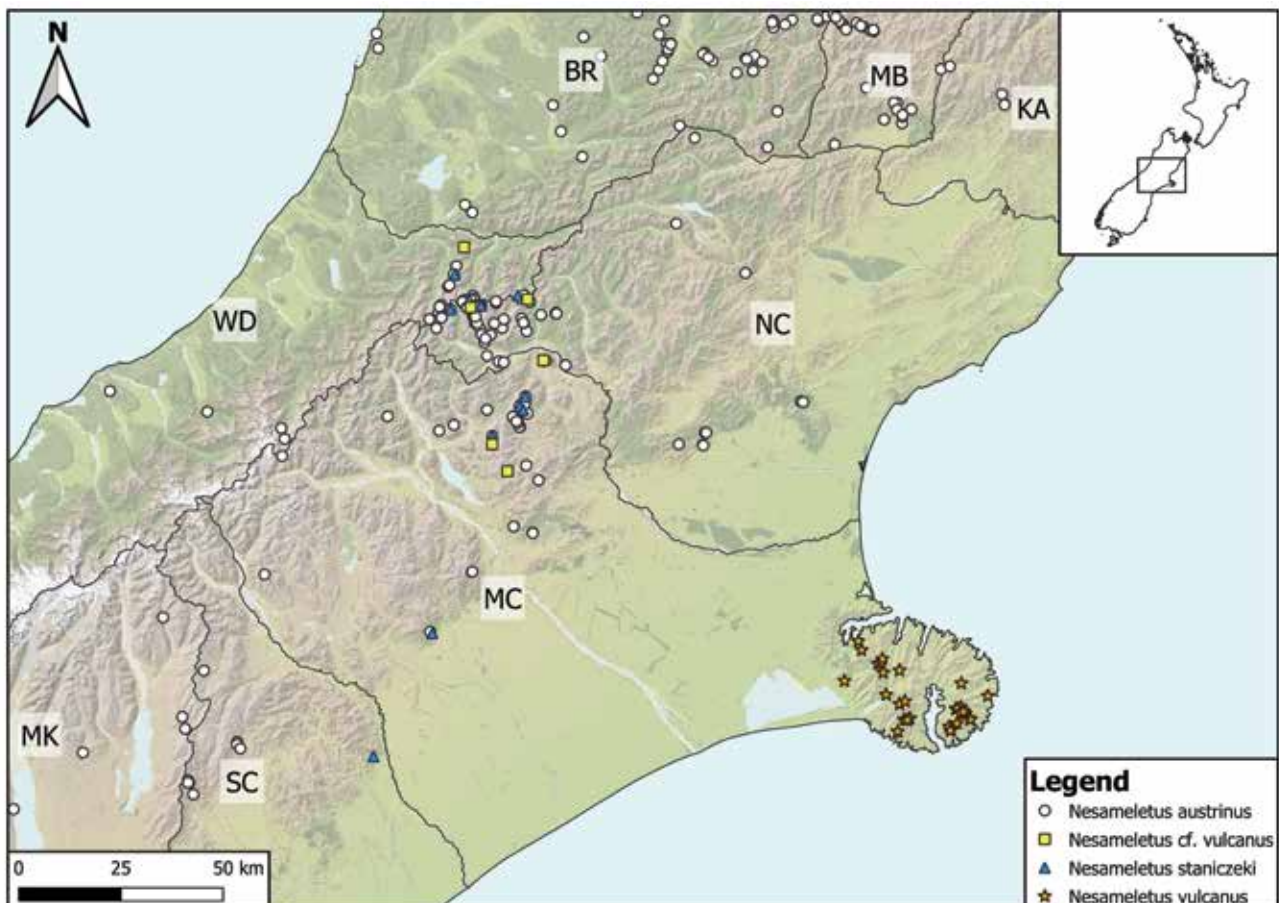


Figure 10. *Nesameletus staniczeki* sp. nov. distribution map. Distribution data for *N. vulcanus*, *N. cf. vulcanus* and *N. austrinus* across *N. staniczeki* range also shown (GBIF.org 2022).

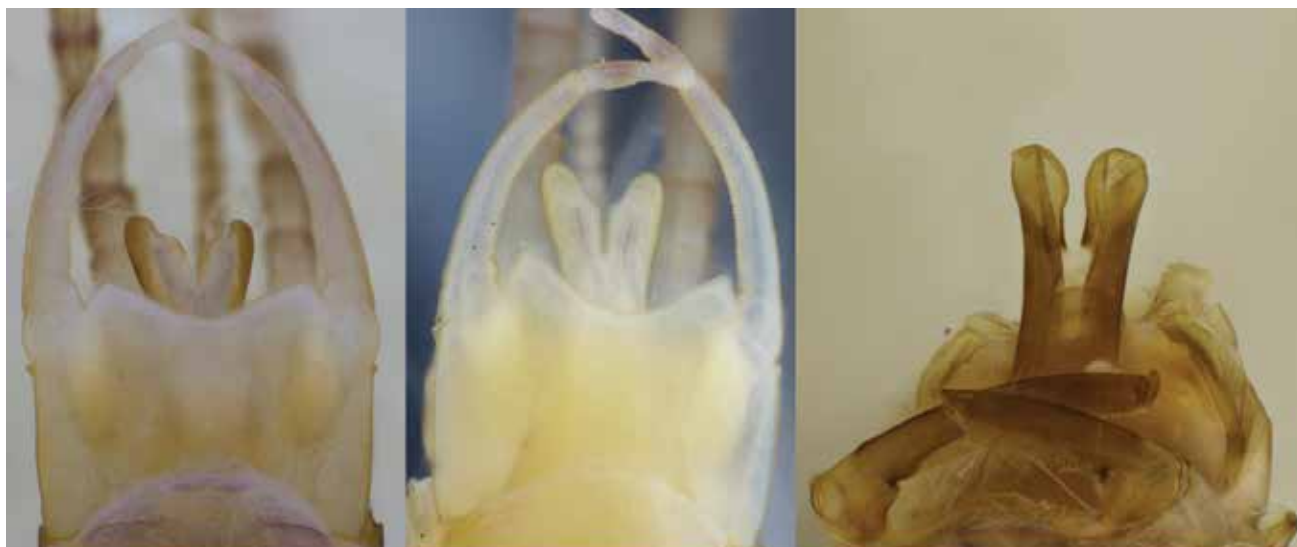


Figure 11. Genitalia (ventral view) comparison between male imagoes of *N. staniczeki*, *N. vulcanus* and *N. austrinus* (Left to Right)

Table 1. Distinguishing features of *N. staniczeki*, *N. austrinus* and *N. vulcanus* imagoes

Imago	<i>N. staniczeki</i>	<i>N. austrinus</i>	<i>N. vulcanus</i>
Markings on femur	Darkening at mid length	Dark band at mid length	No dark band mid length
Forewing crossveins in distal half between Sc and R1	Not evenly spaced	Evenly spaced	Evenly spaced
Forewing bullae	Four bullae on veins Sc, R ₁ , R ₂ and at the fork of vein MA. Clouding at bullae	Inconspicuous bullae without clouding at Sc, R ₁ and R ₂	Four bullae on veins Sc, R ₁ , R ₂ and at the fork of vein MA. Clouding at bullae
Shape of penes (Fig. 11)	Separated by wide v-shaped notch at mid length. Dark brown pigmentation at lateral and apical margins. Broad and extended laterally, slight indentation in lateral view	Fused to mid length, slightly divergent without v-shaped notch and rounded apically. Not broad and extended laterally, no indentation in lateral view	Separated by a narrow v-shaped margin at mid length. Stripe of pigmentation centrally along each penis
Genital plate in female	Shallowly triangular and extending only about one quarter the length of sternum 8	Spatulate and extending usually whole length of sternum 8, rounded	Apically rounded subgenital extending about one third the length of sternum 8
Clouding around forewing bullae Sc, R1 and R2	Present	Absent	Present

Table 2. Distinguishing features of *N. staniczeki*, *N. austrinus* and *N. vulcanus* larvae

Larva	<i>N. staniczeki</i>	<i>N. austrinus</i>	<i>N. vulcanus</i>
Abdominal ganglia	8 pigmented, 7 less so	Strongly pigmented 3 to 8	8 and 7 also usually well pigmented, other ganglia variably visible and usually faint
Denticles posterior margins abdominal tergites (Fig. 12).	A few small irregular denticles on 9, occasionally on 7 and 8	Well-developed and regular on 4 or 5 to 9	Regular, well developed denticles 8–9, occasionally some denticles on 7
Abdominal segment posterolateral projections	Small, present on sternites 7–9, largest on 7	Present on sternites 4–9, large on 9	Small, present on sternites 8 and 9 only
Dorsal abdominal pattern	Mid length with smaller white maculae, does not give appearance of a continuous pale line	Dorsal segments with median longitudinal biconvex white mark and brownish black paired parasagittal longitudinal marks	Mid length with larger white maculae, gives appearance of a continuous pale line

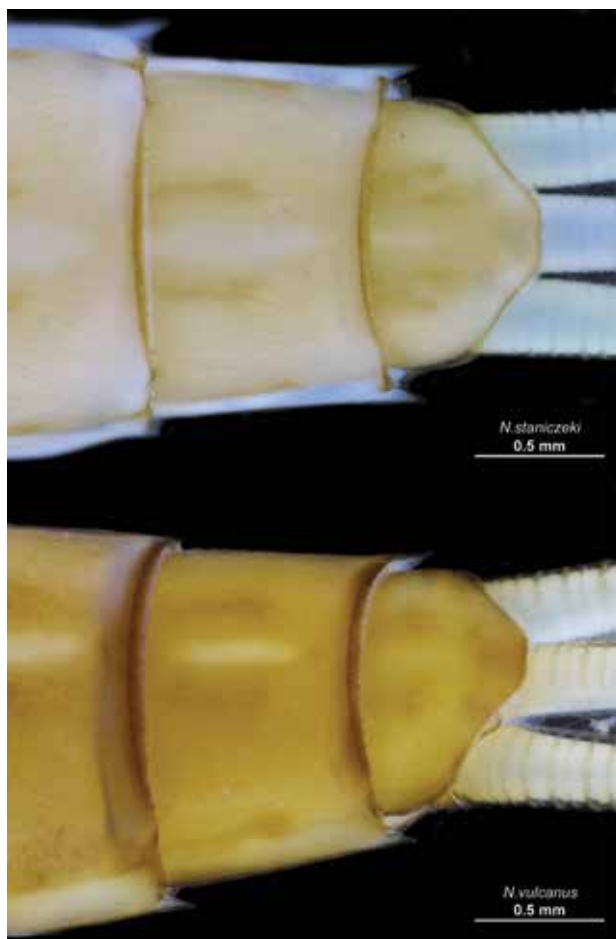


Figure 12. Tergite denticle comparison between *N. staniczeki* and *N. vulcanus*

Acknowledgements

Thanks are due to Simon F Watson, Gillie Temm and Richard Hitchings, who collected specimens, and the Department of Conservation who kindly permitted the collection of insects within the Arthur's Pass National Park and Craigieburn Forest Park (DOC permit number CA-29181-FAU). We acknowledge our debt to the late John Ward for advice. Thanks to Mike Winterbourn and an anonymous referee for comments and suggestions that greatly improved this manuscript.

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- References
- Appendices (as appropriate)
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- Figures
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- Author's professional biography of 70-100 words.

The title page should include the paper title, author name(s) and affiliation(s), email address(es), abstract (150–200 words), up to six keywords listed in alphabetical order and the word count.

High resolution electronic files of images (minimum of 600 dpi, preferably TIF files) will be required upon final submission of the revised paper.

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Spelling is in accordance with the Concise Oxford English Dictionary.

Abbreviated terms	Full stops should be used in abbreviations of Latin terms, such as e.g., i.e., c.f., c. 1984, et al.	Italics	For genera, species, sub-species, names of ships, titles of published books, plays, films, exhibition titles, pamphlets and periodicals. Books and periodicals are italicised in the references, but newsletters are not.
Capitals	Capitals should be used sparingly. All proper names and substantives only where they refer to specific individuals, offices or organisations (e.g. Labour government; the government. Use Prime Minister, but Cabinet minister. Capitalise the first word and all the principal words in titles of publications and in chapter titles. Capitalise both words in a compound title, e.g. Governor–General.	Māori language	Our practice is to use the te reo Māori word first followed by the English translation in round brackets. Macrons are standard practice where appropriate except where original texts (without macrons) are being quoted.
Dates	are written in numerals, e.g. 1800s, 8 May 1923. Spell out nineteenth century, sequential dates in full 1956–1986 using unspaced en-dash, not hyphen, use c. 1984.	Numbers in text	To be in words for numbers up to nine and then use numerals, except for measurement and time e.g. 35 kg, 1.290 km, (all to be converted to metric), 6 hours. Comma to be used in four figures or more, e.g. 8,000. All numbers that begin a sentence must be spelled out. Use an unspaced en-dash not a hyphen for ranges.
Endnotes	Numbered endnotes can be used in the text, but not footnotes. Endnotes should contain enough information to guide the reader to any external references. Endnotes are denoted in the text by sequential, superscript numbers after the sentence that concerns them. The endnote list is placed after acknowledgements and before the reference list.	Omissions	When omissions are made in quoted text, use three dots within a sentence, with a space either side, and four dots when the break resumes in a new sentence, with a space on either side of the dots.
Illustrations	All illustrations, figures and/or tables must be referred to in the text. If referring to a figure in the text, use the full word Figure or Figures. If the figure reference is in brackets, use the abbreviated form (Fig. or Figs.). When referred to in the text, capitalise the word Table. The words figure and table should not be capitalised when referring to a figure or table cited in a reference. Use the following the format for figure captions: Figure 1. Description (credit [where appropriate]). Captions for composite figures should follow the following style: Figure 1. Brief description of the entire figure. A, Specific description of part A. B, Specific description of part B.	Page ranges	Use an unspaced en-dash not a hyphen for page ranges.
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In-text citations and reference list

All works cited in the body of the paper must be included in the reference list and vice versa.

The convention of in-text citations in the format author surname (year) and (author surname and year) is used.

Two authors are cited as Fraser and McCarthy (2012) or (Fraser and McCarthy 2012) and three or more authors as Winterbourn et al. (2008) or (Winterbourn et al. 2008).

Multiple references should be separated by semicolons in order of publication date (Ward 1995; Forster and Forster 1999; Wilson 2008).

When referencing quotes or page numbers a colon followed by a space is used (Bradshaw 2009: 220).

Newspaper articles by unknown authors should be cited in the text in the following format (*The Press*, 19 December 1938: 11) and they should not be included in the reference list.

Formatting of references:

Journal paper

Ward JB. 1995. Nine new species of New Zealand caddis (Trichoptera). *New Zealand Journal of Zoology* 22: 91–103.

Whitehead, SF. 2010. A territory of such varied picturesqueness: Gerard Carrington and the beginnings of the Christchurch Tramping Club. *Records of the Canterbury Museum* 24: 15–25.

Book

Bradshaw J. 2009. *Golden Prospects. Chinese on the West Coast of New Zealand*. Greymouth: Shantytown.

Forster RR, Forster LM. 1999. *Spiders of New Zealand and their Worldwide Kin*. Dunedin: Otago University Press.

Fraser L, McCarthy A, editors. 2012. *Far from 'Home': The English in New Zealand*. Dunedin: Otago University Press.

Winterbourn MJ, Knox GA, Burrows CJ, Marsden ID, editors. 2008. *The Natural History of Canterbury*. Christchurch: Canterbury University Press.

Book chapter

Fraser L. 2012. Memory, mourning and melancholy: English ways of death on the margins of empire. In: Fraser L, McCarthy A, editors. *Far From 'Home': The English in New Zealand*. Dunedin: Otago University Press; pp99–122.

Wilson HD. 2008. Vegetation of Banks Peninsula. In: Winterbourn MJ, Knox GA, Burrows CJ, Marsden ID, editors. *The Natural History of Canterbury*. Christchurch: Canterbury University Press; pp251–278.

Unpublished thesis

Malumbres-Olarte J. 2010. Spider Diversity and Ecology in Native Tussock Grasslands of the South Island, New Zealand. PhD thesis. Lincoln: Lincoln University.

Website

Food Standards Australia New Zealand. 2008. Canned foods: purchasing and storing. Wellington: Food Standards Australia New Zealand. [accessed 15 February 2015]. Available from: <http://www.foodstandards.govt.nz/consumer/safety/cannedfoods>

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