

# Nail Chronology: The Case of Te Puna Mission Station

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*Nails recovered from the investigation of Te Puna Mission Station in the Bay of Islands, New Zealand, are analysed in the context of archival data on materials supplied by the Christian Missionary Society store and used in other Church Missionary Society Buildings in the Bay of Islands. This analysis provides a case study of a regional nail chronology useful for dating purposes. Numbers of wrought and cut nails used in the construction of the mission house can be used to provide a likely date for its construction as well as its demolition, an event that is not recorded in any archival material.*

## INTRODUCTION

This paper presents a discussion of the nails recovered from Te Puna, the location of one of New Zealand's earliest mission stations (Figure 1; Middleton 2003, 2005a,b), using an approach developed by Adams (2002), who argues for the development of regional nail chronologies as a dating tool. In the Bay of Islands, evidence of building methods and nail use by the Church Missionary Society (CMS) is used to develop this local chronology.

Archaeological investigations carried out at the site of the former Te Puna mission station in 2002 revealed the remains of the principal mission house demolished into the cellar that was once beneath the main structure of the house (Figure 2). Bricks, stone, timber and window glass along with many other artefacts revealed evidence of the structure as well as of daily life at the mission, the home of the John and Hannah King and

their family. Archival evidence tells us that building began at Te Puna in 1828, that the King family moved to the house in 1832, and that members of the family continued to live in the building after John and Hannah King's deaths in the 1850s (King n.d.a, b; Middleton 2005a, b). However, there is no clear indication in the archives of the date of abandonment or demolition of the structure. The nails recovered from the site provide evidence of a likely end date for the occupation of the mission house.

In December 1814 New Zealand's first mission station was established at Oihi, in the Bay of Islands, under the auspices of the Church Missionary Society and through the work of Samuel Marsden, Parramatta's 'flogging parson' (Hughes 1987) who was chaplain to the colony of NSW. The missionaries consisted of three couples, amongst them John and Hannah King and their first child. A second infant was born two months after their arrival. A small number of

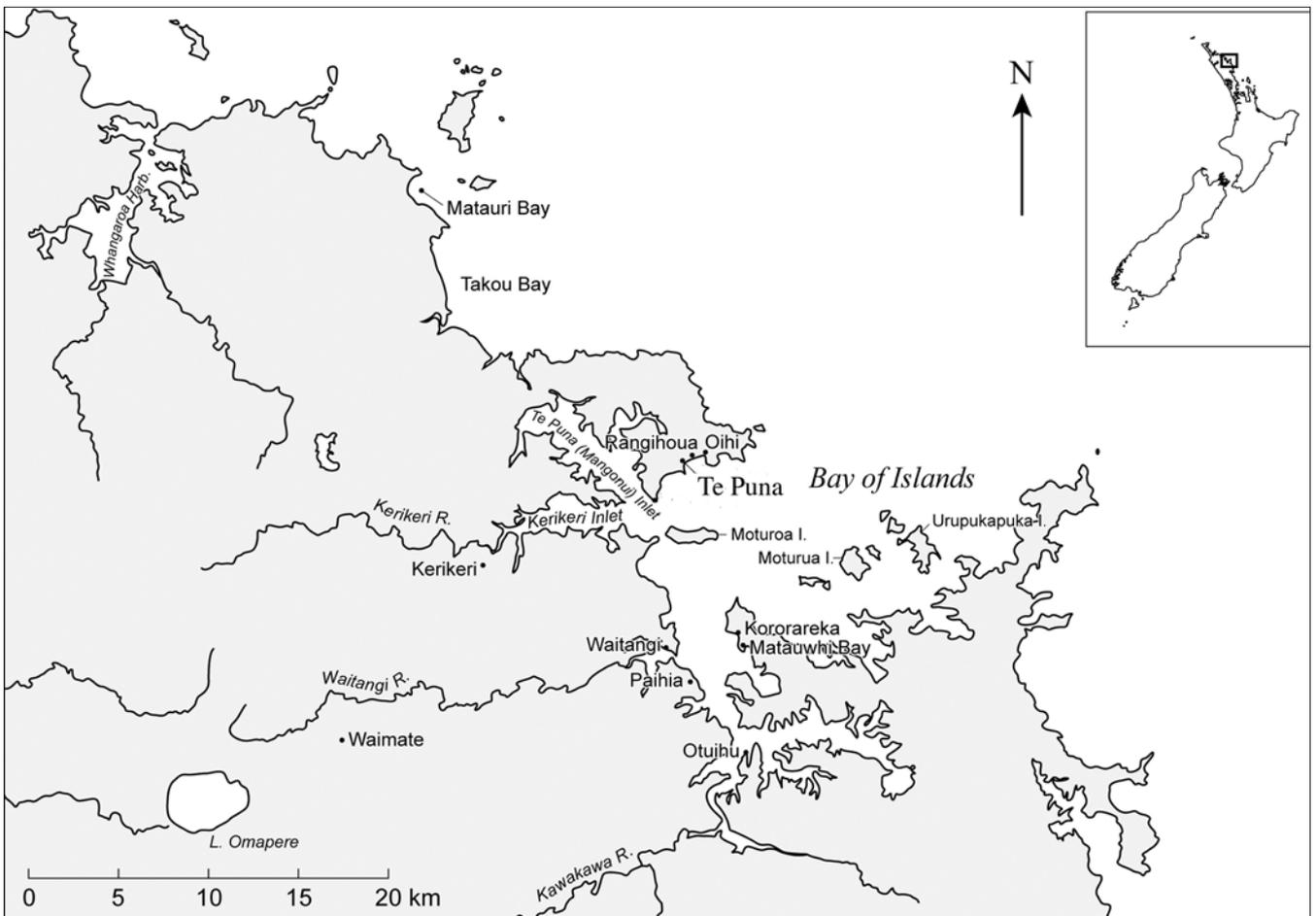


Fig. 1: Bay of Islands locations.

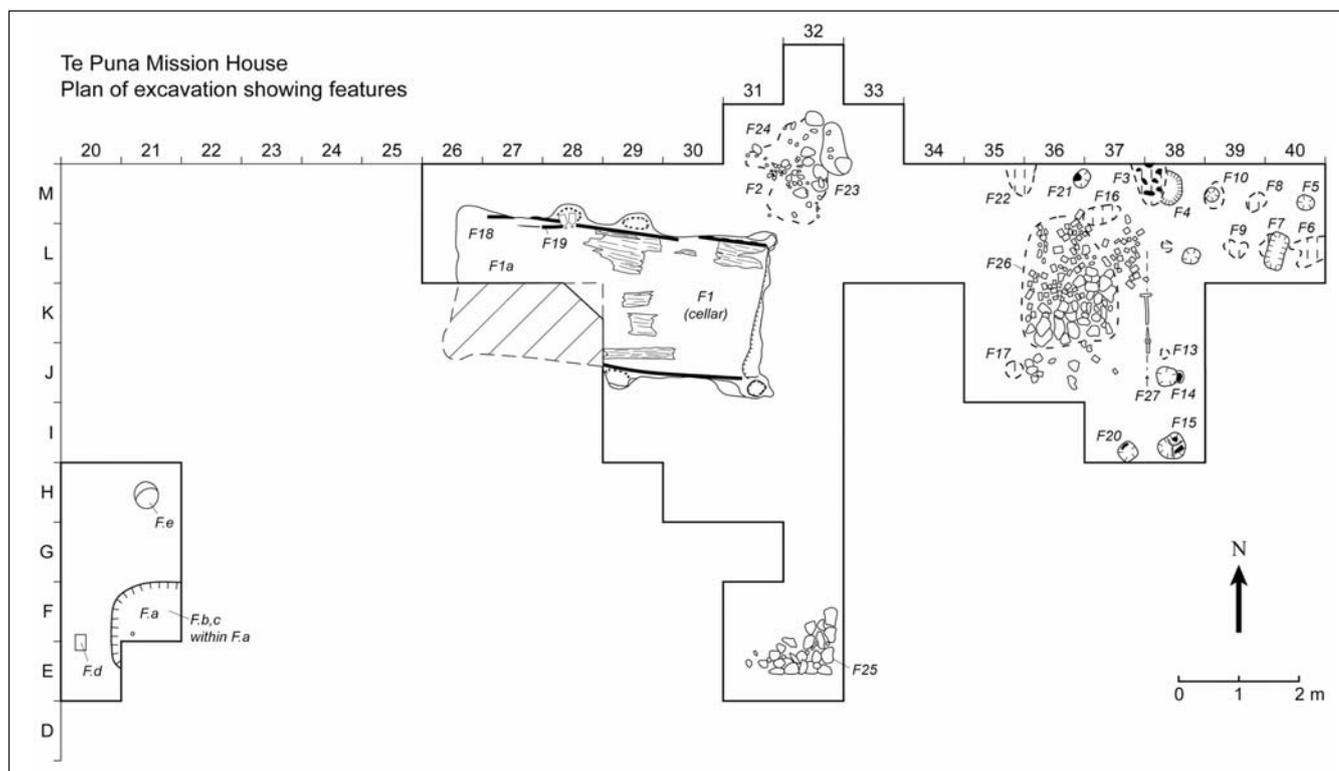


Fig. 2: Plan of investigation of Te Puna Mission House showing features.

tradesmen, mostly convicts on leave from NSW, also accompanied the mission (Elder 1932, 1934; Middleton 2005a). Subsequently, a number of other mission stations were established in the Bay of Islands; Kerikeri, where the CMS store was based, in 1819; Paihia, in 1823 after the arrival of Henry and Marianne Williams; Waimate in 1830 and Te Puna in 1832 (Figure 1). Te Puna was closely associated with Oihi, the first station. It was located only about two kilometres to the west, on the far side of Rangihoua Pa, where significant Maori figures such as Te Pahi and Ruatara, once friends of Marsden and his inspiration for the mission, had lived.

Today, the Kerikeri Mission House and Stone Store form significant heritage properties run by the New Zealand Historic Places Trust. The CMS store was located at the Kerikeri mission from its establishment, and the Stone Store was constructed for this purpose, completed in 1836. From there provisions, building materials, clothing, trade goods and in fact nearly all items used by the different missions were distributed. The accounts of the CMS store (CMS n.d.-a, -b, -c) provide a useful source to expand on and contextualize the artefacts recovered from the investigation of the mission house, and can be used to create a full picture of the economy and material culture of the Te Puna mission. These accounts also include the supply of nails and other materials to John King when he was building the Te Puna house (Middleton 2005a).

## A BRIEF HISTORY OF NAIL MANUFACTURE – WROUGHT, CUT AND WIRE

The majority of nails recovered from the Te Puna cellar are wrought nails, of the kind imported by the CMS in the first decades of the nineteenth century and used for building the Kerikeri Mission House and Stone Store, amongst other mission buildings of the era, closely related to the Te Puna mission house. At the Stone Store today, tourists can still buy ‘hand-wrought’ and ‘cut’ nails manufactured by the early methods.

In the late eighteenth and early nineteenth centuries, wrought nails were hand forged in British industrial towns, manufactured by hammering a length of square-shanked iron rod on four sides to form a point, or, for a chisel pointed nail, hammering on two sides to a flat end. The head was then formed by ‘swaging’, or drawing the length of the nail through a bore, snapping off the rod above the bore, and beating the nail to shape the head (Wells 2000; F. Clunie pers. comm. February 2003). The forged or wrought nail is easily identified by the state of the metal, as it has a ‘wood-like’ grain running lengthwise. When in a rusted or deteriorated state, this metal tends to flake off in lengths, also making the wrought nail easily identified. The nail literature often notes that cut nails are rectangular in cross section and wrought nails square (for example, see Prickett 1981, 1994). However, as Wells notes the cross-section of wrought nails may vary depending on the method of manufacture of the nail rod from which they were produced. Before the seventeenth century, nail bars were produced by drawing out large bars to a smaller size, by beating with a hammer. This method, which generally produces a square cross-sectioned wrought nail, continued to be used after the more mechanized production of nail rods because it required only basic blacksmithing tools and could therefore be carried out as a cottage industry. Later in the seventeenth century, more mechanised methods produced nail bars that were rolled and slit by machine. Wrought nails produced from these nail bars are often rectangular, rhomboid or trapezoid in cross section. Wells also notes (2000:331) ‘Generally, hand-made nails tend to taper on all sides to the point and maintain a square cross section, though many such nails have a rectangular cross section, with parallel sides, on the upper one-third to one-half before they gradually taper to the point.’

The methods for manufacturing cut nails were first developed in America in the 1790s (Varman 1987; Wells 2000). By this process cut nails were produced more cheaply than wrought, being cut from a sheet of iron by machine, then headed by hand until the development of cutting and heading machines. Cut nails tend to have a rectangular shape, with a

two-sided taper as opposed to the four-sided taper of the wrought nail, often with a burr remaining on the cut face of the iron. During the first decades of production cut nails had the grain running across the nail, resulting in weakness and a tendency to break when clenched (hammered flat against the nailed surface, to hold fast). In America, by the second decade of the nineteenth century, nails were being cut from plates with the grain running lengthwise, producing a stronger product when clenched (Wells 2000:325). Another diagnostic feature of the cut nail is the indentation on the shaft below the head known as the 'pinch', formed where the shaft is grasped by a clamp before heading (Wells 2000:332).

By the later nineteenth century, wire nails were being produced from a process patented in France in 1806 (Adams 2002). By this method, nails were manufactured from drawn wire in a process that allowed cheaper mass production. Initially viewed with suspicion and referred to in Britain as 'French' nails, wire nails were first imported into Australia in 1853, but did not replace the wrought nail in popular use until about the 1870s (Varman 1987:107). Wire nails came to New Zealand with the first French missionaries and were used in the Bay of Islands in 1842 in the construction of the Marist printery now known as Pompallier House, but were not in common use until about the same time as in Australia (F. Clunie, pers. comm. Feb. 2003).

#### **The nail literature: New Zealand and elsewhere**

An analysis of nails first appeared in the literature of New Zealand historic archaeology with Prickett's (1981) PhD thesis, *The Archaeology of a Military Frontier: Taranaki, New Zealand, 1860–1881*, followed by Ritchie's (1986) *Archaeology and History of the Chinese in Southern New Zealand during the Nineteenth Century*. Prickett found that all the nails from the Omata Stockade were cut, apart from two wire nails, on the basis of the assumption described above, that all wrought nails are square in cross-section and all cut rectangular, the Omata ones being rectangular. It is also apparent from the illustrations that the nails here have the clear cross grain of cut nails, rather than the lengthwise grain of the wrought nail. Prickett (1981:560) found very few nails at the Warea Redoubt, apart from 'fragments of slice nails of perhaps 100–130mm length'. These 'slice' nails may be wrought nails reduced to thin lengths by the tendency of wrought metal to flake off lengthwise with the grain, as is the case with many of the nails from the Te Puna cellar, leaving a long, thin slither of what may have originally been either a square or rectangular nail.

Ritchie (1986) stated that detailed research into information about nails was beyond the scope of his work, and pointed to this as a future need. Ritchie's (1986:445) work delivers a detailed typology of nails according to head shape, based on 'predominant 'European uses'' and observations of one standing Chinese structure, but makes no use of Prickett's or Varman's earlier discussions of different manufacturing technology, and does not differentiate between wrought, cut and wire nails. He does make an 'important distinction ... between 'nails' (i.e. nails with cylindrical shafts) and 'spikes' (i.e. nails with square or rectangular wedge-shaped shafts)'. While Ritchie's typology provides detail about uses of different types of nails, typology does not provide chronology. As Wells (2000:327) points out, function is the least useful of categories for dating purposes, and 'cannot be known out of its original context.' There are no dates mentioned in the context of this analysis, where Ritchie's main concern appears to be with the relationship between ethnicity and material culture.

Ritchie's 'nail' and 'spike' nomenclature has been used in subsequent analyses such as Bedford (1986) and Macready and Goodwin (1990). These works categorise nails according

Ritchie's (1986) head type, but exclude entirely any discussion of manufacture technology and dating. Apart from providing no information about chronology, a typology based on head type is of limited use when dealing with nails in a deteriorated condition, when the head may be the least identifiable part, while the shank may provide more useful information about manufacture and dating. Others, such as Felgate (1998) and Young (1995) make no mention of nails excavated in the course of major excavations at Auckland's His Majesty's Theatre and Sky City sites, leading to the question whether nails have generally been too hard or too dull to deal with. However, Challis (1994) does use the nails recovered from the Edmonds ruins to add to his discussion on dating, and contextualizes these with others used in the Bay of Islands in the same period.

In Australia, Varman's (1987) paper, first published in 1980, remains useful for its discussion of manufacturing technology and the dates at which different types of nails were in use in Australia, some of which relate to New Zealand. A more recent brief attempt to create a chronology of nails in New Zealand was produced by Hamel (2002). However, Hamel makes no differentiation between wrought and cut nails, an important distinction for an early to mid-nineteenth-century context, as at Te Puna, and simply attempts to transpose a North American chronology into New Zealand. A more precise examination of nail manufacture, as well as an examination of regional differences such as is available in the Bay of Islands through CMS evidence, is required to establish chronology.

Wells (2000) argues for an American chronology based on nail manufacturing technology and the evidence of use of nail types. This provides detail about nail production and morphology, useful in historical archaeology in any context. While Wells' chronology is specific to Louisiana ('the Louisiana Nail Chronology') and is not applicable here, his methods of developing this approach are valuable as a model for other areas, and can be usefully considered in conjunction with Adams' (2002) paper on dating nails in nineteenth and early twentieth-century American sites. Adams argues that nails can provide the key to dating historic sites, especially where there is no documentary evidence available, calling for regional nail chronologies such as that developed by Wells, with the consideration of local and regional variations caused by factors such as importation and transportation.

In the Bay of Islands, long-term restoration and investigation work on heritage sites such as that carried out by Challis (1994), Best (1995; 1997; 2003) and Fergus Clunie at Pompallier House and the Kerikeri Mission House and Stone Store has yielded some of this specific local information. In this region of New Zealand, the CMS imported British-manufactured wrought nails from Port Jackson until the early 1840s, when the cut nail started to become more popular. Both wrought and cut nails have been found at the Kerikeri Mission House and Stone Store, used in building contexts dating to about 1860. From the 1870s onwards the wire nail became increasingly popular, while the use of cut nails such as brads continued for the nailing of floors and other areas where a tight fastener was required (Clunie n.d., pers. com. June 2002).

Ten different types of wrought nails were traded from the Stone Store, amongst several hundred different types manufactured in the nineteenth century (Clunie n.d.). These include rose-head, clouts, and brads, the only types identified amongst those recovered from the Te Puna cellar. The Stone Store information sheet (Clunie n.d.) gives some information about the specific uses of these types of nail. Rose-headed nails (a term which Wells (2000:98) finds 'too vague to be useful') come in three types, sharp, flat and clench. The sharp-pointed is used for hard woods, and coarser work, the flat for

soft wood, and the clench, square-shanked and square-tipped, may be used for sheathing boats and for crates and boxes. The clout, usually shorter, with a flat head and sharp point, was often used for fastening leather and ironwork to wood, while the brad, shaped like a '7', was used for fastening floor and lining boards.

CMS (n.d.a) accounts indicate that John King was supplied with large quantities of fasteners during the period he was building the Te Puna mission house, screws as well as nails. The accounts list a number of different types of nails: 'spike nails, nails sizes, iron boat nails, copper boat nails, flat clout nails, brads, tin tacks, rivets'. The original accounts do not specify the kind of detailed typology that Clunie (n.d., above) describes. In the year from April 1831 to March 1832 John King received a total of 543 lbs of nails in unstated sizes and 9 lbs of brads, as well as tools and building materials (CMS n.d.a; Middleton 2005a, b).

## THE TE PUNA ASSEMBLAGE

### Methods

There were several types of fasteners recovered from the Te Puna cellar: nails, screws, spikes, staples, rivets, bolts and pegs. Nails and spikes were sorted according to portion, i.e. complete (head, shank and point); incomplete (head and part of the shank); shank only. For the purpose of calculating MNI, only complete and incomplete portions were included, i.e. those parts which include the head of the nail. Shank numbers, while recorded, were discarded from this calculation as they could be duplicated in the 'head' numbers.

Fasteners were recorded as spikes if they were greater than 10mm in width and generally greater than 100 mm in length if complete, although fasteners up to 130 mm in length were recorded as nails if they were below this width. This distinction between nails and spikes is in keeping with the terms used in dealing with the fasteners at the Kerikeri Mission House, and in the archival records of the CMS Kerikeri store (n.d.a, b, c), as well as with Wells' (2000:98) definition of a spike as a 'large nail'. 'Spike' is not used as a general term for all cut or wrought nails. Complete nails and spikes were measured for length, identified where possible as rosehead, clout, or brad, as square or rectangular and as having either a four or two sided taper. Identification of the 'rosehead' type was difficult as the metal of the head was often flaked, making the head flat when it may not have been originally.

Methods of manufacture described consist of wrought, cut and wire. Nails, spikes and screws were compared with wrought and cut samples of these obtained from the Kerikeri Mission House and Stone Store. Copper nails, with a square cross section, were included in a separate category.

### Results

A total of 3396 fastener fragments (NISP) were recorded, giving a total MNI of 1982 nails and spikes (including copper). Of these, 1197 were complete and the balance (785) was incomplete, i.e. head and only part of the shank present. Other forms of fasteners identified consisted of four pegs, i.e. a wire peg with a parallel loop that is probably a tent peg, six rivets, four screws (Figure 3) and seven (fencing?) staples. There were also a large number (131) of a form of staple I have identified as 'case staples', which appear to be unique to the Te Puna cellar assemblage. These are shaped like a staple, but have an extra angle of wire. These staples were recovered from the floor of the cellar in association with many of the intact bottles, including case gins. I have identified them as 'case staples' on the assumption that they may have been used to hold together wooden cases to contain bottles.

Of the total MNI of 1982, 961 nails and 33 spikes were identified as wrought, with 681 of the wrought nails complete (Figure 4). In 888 nails (489 of these complete) and 11 spikes the manufacture method was not identifiable, while only 30 nails (20 complete, ten incomplete) were identified as cut, and fourteen of wire manufacture (Table 1). There is a total MNI of 43 copper nails and 2 copper spikes (Figure 5), from a total NISP of 72. The unidentified nails are all of square or rectangular cross section, and so are either cut or wrought. They are not wire nails, as the fourteen wire nails stand out with a morphology clearly different from the wrought and cut nails (Figure 3, 4).

Table 1: Frequency of nail manufacture method.

Fastener type	Manufacture method	MNI
Nails	Wrought	961
Nails	Unidentified	888
Nails	Cut	30
Nails	Wire	14
Spikes	Wrought	33
Spikes	Unidentified	11
Nails – copper	Unidentified	43
Spikes – copper	Unidentified	2



Fig. 3: Wire nails (left), rivets and peg (centre), hand-cut screws (right).

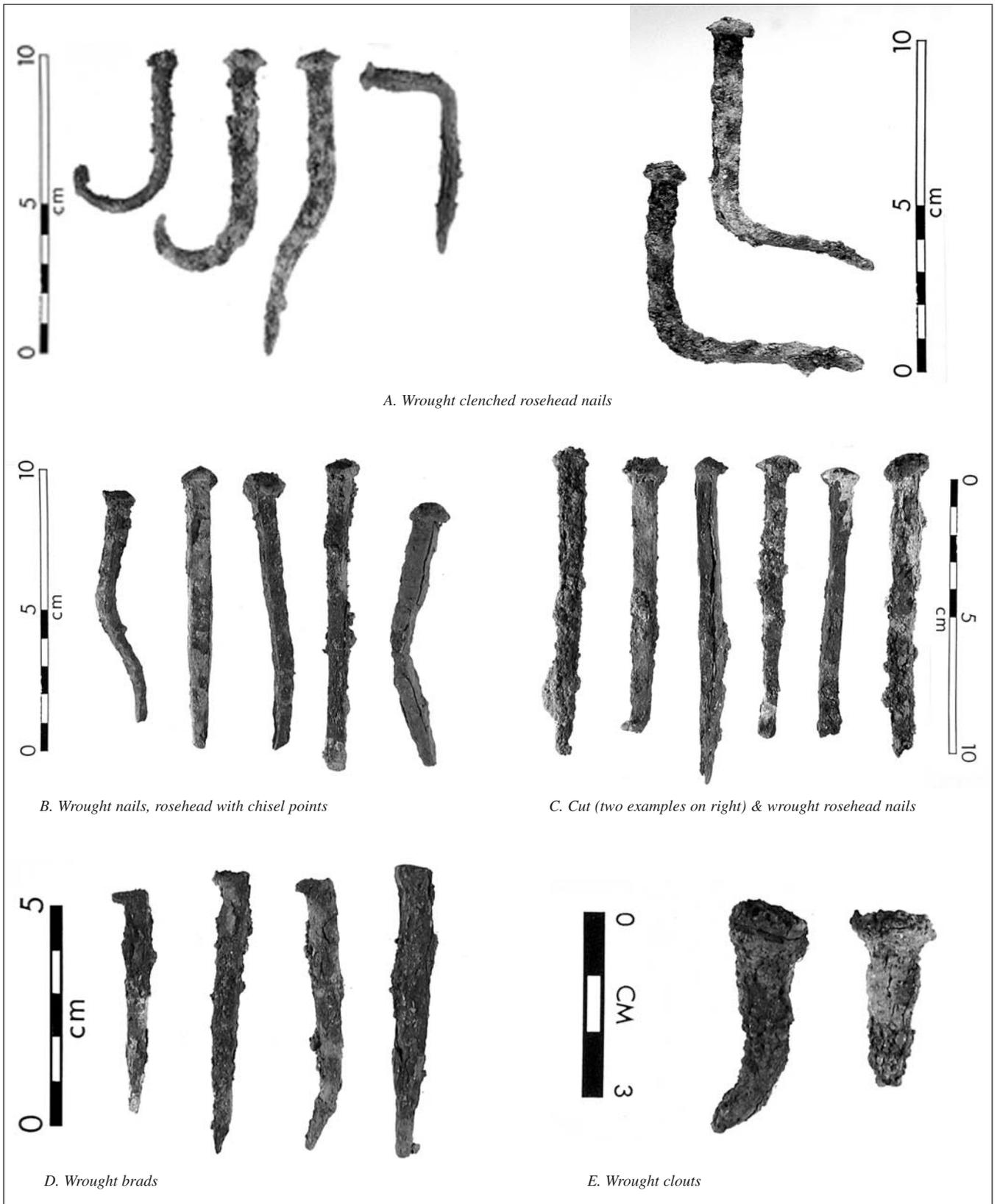


Fig. 4: Nails, Te Puna Mission House investigation March 2002.

The largest number of nails, 308, were 40 mm in length, followed by 208 of 50 mm, 186 of 30 mm, 168 of 60 mm and 139 of 70 mm. The fourteen wire nails were not included in this table as it was apparent that these were not used in the initial construction of the building, but became incorporated into the assemblage at a later date, either from repairs carried out or in wood later left at the site. While in most cases the

head form could not be identified, of the total MNV 383 nails were identified as rosehead, 57 as clouts, and 33 as brads (Figure 4).

The longest complete spike, 280 mm, was 17 mm wide. The widest spike recovered, 20 mm, was incomplete at 250 mm. A further complete spike, while only 50 mm long, was recorded as such because of its width above 10 mm.

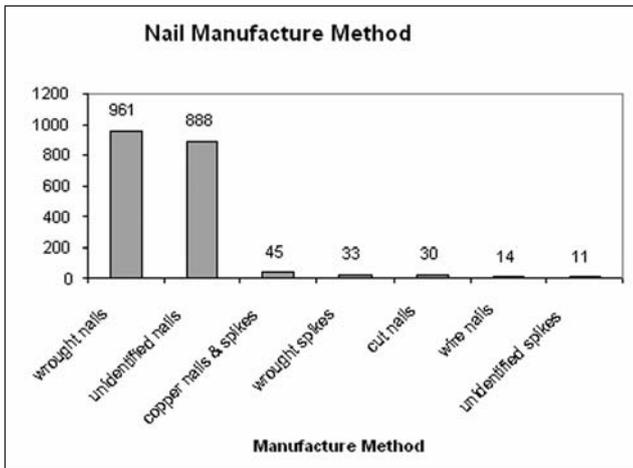


Fig. 5: Frequency of nail manufacture method.

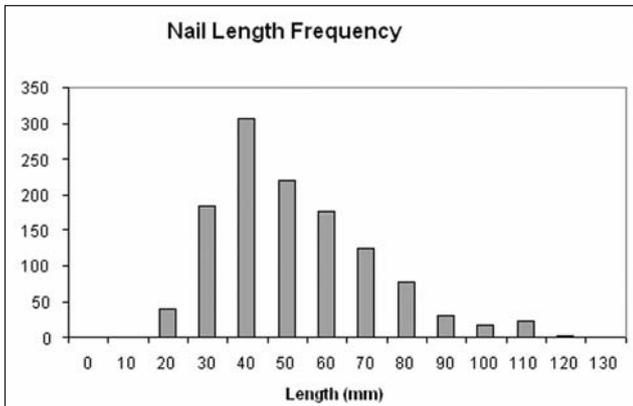


Fig. 6: Nail length frequency of total MNI of complete wrought, cut and unidentified nails, wire not included.

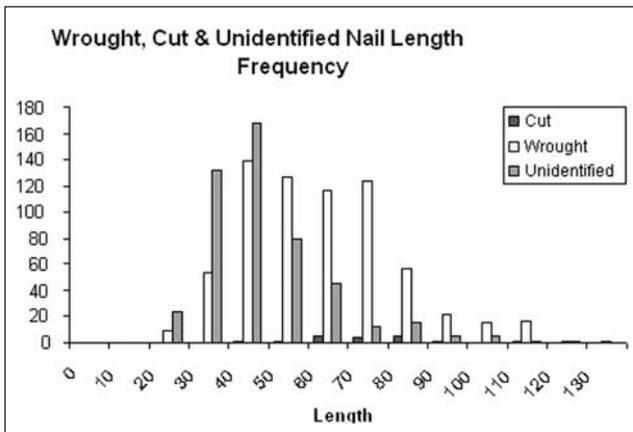


Fig. 7: Frequency of MNI of complete wrought, cut and unidentified nails.

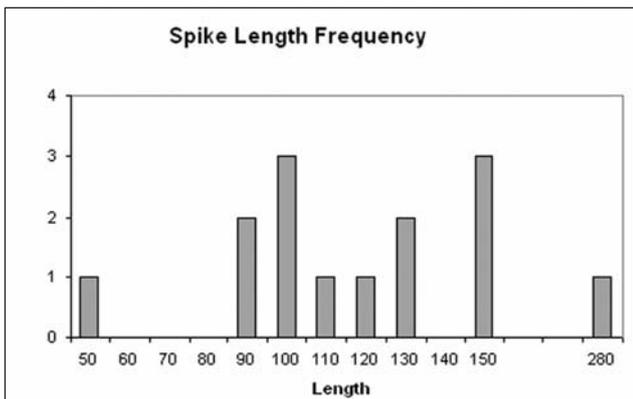


Fig. 8: Spike length frequency.

## Provenance

Wrought and unidentified nails were recovered throughout the site, from the floor of the mission house cellar, the cellar fill, and from the surface and topsoil across the excavation area. Only two cut nails were found on the cellar floor, and the balance, 28, in layer one towards the north-east end of the building and in layer two above the north wall of the cellar. Spikes were also found throughout the stratigraphy, with one from the cellar floor and the balance from the turf of the western and eastern squares excavated (in the line of tools along the outside northeast wall of the building). The wire nails were only recovered from layers one and two. The four tent pegs came from layer one and part of the fill, suggesting that these may have been left behind by campers on the site in the recent past, while the fencing staples, from layer one and two, may also have been left on the site recently. Nearly all the case staples (131) were found on the cellar floor, with another 20 in the fill.

While the copper nails and spikes were also scattered throughout the excavation area, the largest proportion of these, 47 of the total NISP of 73, were recovered outside the cellar, from the eastern end of the excavation and outside the north wall of the cellar (squares M27-40). The remainder of the NISP was recovered from the cellar floor and fill. One of the copper nails from the cellar fill was still in situ in a small piece of wood (TP 182) pointing to one of the possible original uses of these nails. The nail and wood have corroded together, photographed in cross-section (Figure 9 C). Here the original square outline of the copper remains in the wood, which has been identified as an exotic species of conifer. Other fragments of wood found intact with a copper nail (TP 331) have been identified as a species of exotic angiosperm (Dr Rod Wallace, pers. comm. August 2002). It is likely that these fragments of wood and copper were used in wooden cases or containers that arrived in the hold of a ship, copper nails being used to prevent corrosion.

## DISCUSSION AND CONCLUSION

There is clear documentary evidence associated with the building of the Te Puna mission house and the move there following the closure of the Oihi mission (King n.d.a, b; Middleton 2005a, b). This documentary evidence gives a date of 1828 for the commencement of building and 1832 for the move to Te Puna. The archaeological evidence for dating the building provided by the nails from the Te Puna cellar is congruent with this, indicating that the mission house was built using mostly wrought nails. This is the kind of nail issued by the Kerikeri store up until the late 1830s or early 1840s, and used at the Kerikeri Mission House and Stone Store and other mission buildings in the Bay at this time. The small number of cut nails and the larger number of either wrought or cut (unidentified) nails from the site is consistent with the occupation of the house by the King family over the forty or so years following completion of the building. As only two of the cut nails were found on the floor of the cellar and the rest within layers one and two of the stratigraphy wrought nails may have been mainly used for the construction of the building and the cut nails for later repairs or additions.

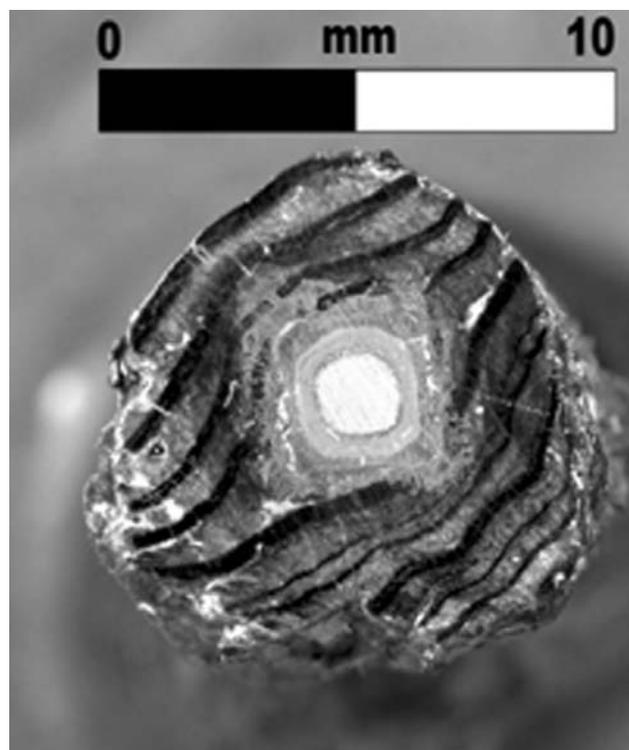
However, while there is archival evidence for the building of the house, no documentary evidence has yet been found for the demolition of the mission house. Following the death of Hannah King in 1851 and John King in 1854 their children inherited the family land surrounding the sixteen acres of the Te Puna mission. They remained living at the mission until it was purchased from the CMS by John Tollis Hansen in 1874 (Hansen 1994; LINZ n.d.; Martin 1990). The chronological



A. Wrought spikes with chisel points



B. Copper nails and spikes



C. Cross-section of corroded copper nail in exotic wood

Fig. 9: Iron & copper nails & spikes, Te Puna Mission House assemblage.

evidence provided by the nails sheds some light on a likely end date for the occupation of the mission house. The use of wrought and cut nails is consistent with construction in the 1830s and ongoing repairs and occupation up until approximately 1870, when wire nails became increasingly popular in New Zealand and in the Bay of Islands. The small number of wire nails excavated, only fourteen, provenanced to the upper layers of the stratigraphy indicates that the site was abandoned before wire nails were used consistently from the early 1870s onwards.

The CMS archives and structures provide specific information in the Bay of Islands about building methods as well as the supply of nails. This allows the development of a regional nail chronology in this area of New Zealand, as Wells (2000) and Adams (2002) have argued for in the United States.

This paper provides a starting point for the development of nail chronologies in other regions of New Zealand and the further use of nails for the dating of historical archaeological sites.

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