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Pits Long, Large and Prestigious: Recognition of Varieties of Māori Kūmara Storage Pits in Northern New Zealand

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ABSTRACT

Consideration of the sizes and dimensions of *kūmara* (sweet potato) storage pits from six excavations in the northern North Island of New Zealand has shown that some pits within the assemblage stand out from the ordinary, through being either unusually long in relation to their width, or large, or both. Long pits, in particular, are not part of the archaeological landscape of visible pits in the region. The excavated examples are typically within settlements and have been re-filled after use. The reasons for these extravagances are examined and it is proposed that the pits were built in this way to display a wealth of food. Long pits appear to have been a characteristic form in the sixteenth century and possibly for a somewhat broader time span, but did not continue to be built until the end of prehistory. They may have been replaced by other ways of displaying food wealth. Links to historically recorded displays of food are suggested.

Keywords: NEW ZEALAND, NORTH ISLAND, MĀORI, STORAGE PITS, KŪMARA, FOOD DISPLAY.

INTRODUCTION

Rectangular pits are a common feature in North Island New Zealand archaeology. Many have now been excavated and they are conventionally thought to have been for the over-winter storage of *kūmara* tubers (sweet potato — *Ipomoea batatas*). This form of storage was developed to accommodate the seasonal growth of the plant in New Zealand, which was unlike the manner of growth in the tropics. The purpose of storage was twofold, to have a source of new plants in the spring and to hold some for consumption after the crop was harvested.

Food has important roles in human society beyond sustenance. Partaking of food is never a simple matter of taking energy from whatever is available. What and where we eat and who we eat with are strongly conditioned by innate and culturally acquired behaviour. Our rituals and language to do with food reflect fundamental aspects of our nature and beliefs. Once societies had the potential to produce storable surpluses of food, control and redistribution of these surpluses became a central part of organisation of both societies and settlements, for food was a considerable store of wealth able to be mobilised to meet other

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objectives. Structures associated with food storage in archaeological sites therefore deserve considerable attention for what they may tell us about the society responsible for the sites.

In this paper six excavations which revealed pit sizes are reviewed. The locations of the sites are shown in Figure 1. The excavations were selected from a much larger number where pits had been exposed, because they each had a reasonable population of excavated pits, information on the size of the pits was readily available and, in most cases, unusually long pits appeared to be present. The author worked as an excavator on three of the sites.

Aotea (R15/10) is an open settlement situated a little to the north of the Aotea Harbour on the west coast of the North Island. It was excavated in 1972–75 by Cassels (Fox and Cassels 1983). Thirteen pits at this site are included in this study. There was a wide range of other cultural evidence from the site.

Kawerau was not a single site but rather a discrete area in which the investigation, as part of its objectives, sought to excavate a series of pits in undefended locations. The excavations took place in 1981–82. The sites are near the town of Kawerau in the Bay of Plenty, in an area of fertile soils inland from the coast. Lawlor (1983) has published information on the pits. Other evidence associated with them was relatively limited. Thirty-nine pits were taken into this study. The variation in pit size considered here is only a small part of the variety in features in this group.

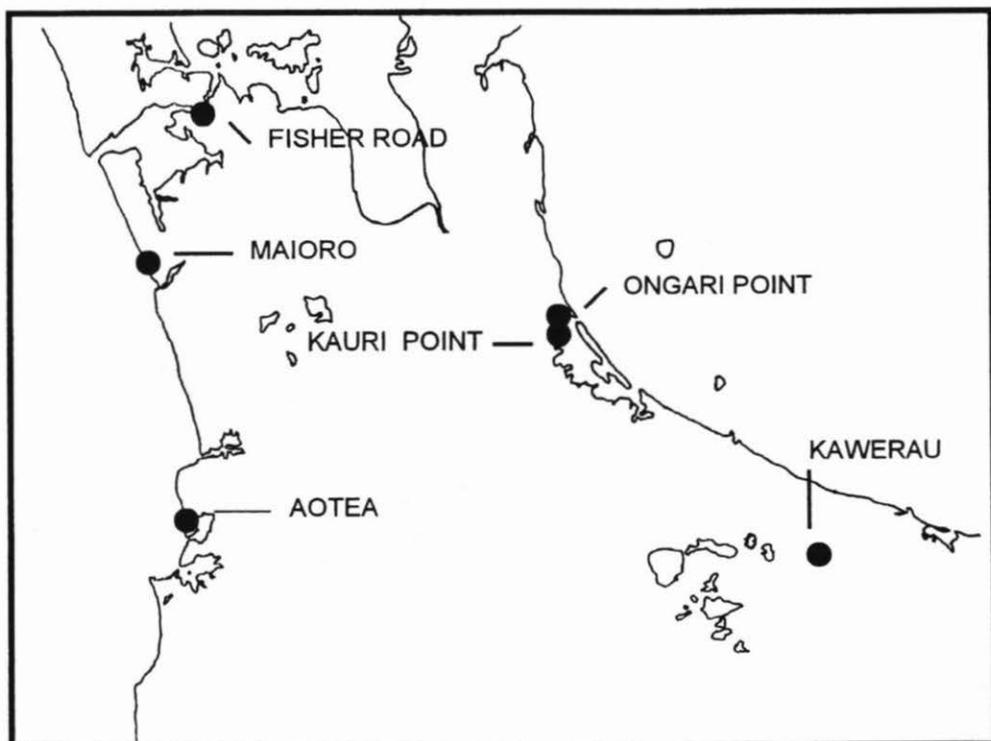


Figure 1: Location map of part of the North Island showing the sites studied.

Kauri Point undefended settlement (U13/6), near Katikati on the Tauranga Harbour, was excavated by Green in 1962 (Green 1963). This site was described as an undefended settlement to distinguish it from the nearby Kauri Point *pā*, excavated by Golson. The evidence recovered from the undefended settlement was dominated by the 13 pits considered here.

Shawcross was the excavator of Ongari Point (U13/8), a large defended site with a wide range of evidence, only a short distance from Kauri Point. The excavation took place in 1963–65 (Shawcross 1964, 1966). This site had much filling and re-digging of pits in prehistory so that dimensions could not be established for all of the pits. However, it was possible to obtain dimensions of 14 of them.

Maioro (R13/1) is just north of the Waikato River mouth on the west coast. The site was excavated by Green in 1965–66 and reported by Fox and Green (1982). Eight pits are considered here. This site proved to have been defended with a palisade, although it was initially thought not to be fortified, being little different from other apparently unfortified sites in the vicinity. Figure 2 shows part of the excavated site as an indication of the sort of evidence considered here (Fox and Green 1982: 74).

Fisher Road is a locality within the Auckland urban area. A rescue excavation by Foster and Sewell in 1985 found a wide range of pits. Twenty-four pits from two adjacent sites, R11/887 and R11/899, are considered here. The sites produced a good range of other evidence (Foster and Sewell 1989). They had virtually identical contents and dates and so the pits have been treated here as one assemblage.

Only the plan dimensions of the pits are considered here. Information on the depths was available for some of the sample (though not for some at Ongari Point which were deliberately not emptied in the second season there). It was decided not to work with the depth information, because in sites where there had been repeated re-digging of pits it is often uncertain where the original ground surface was when the earliest of the pits were dug. The effect of repeated digging is that the original surface is not always apparent.

PIT SIZES AND SHAPES

Pit dimensions were given in the excavation reports in some cases. Elsewhere they have been scaled from the published plans. The 111 pits in the sample average 3.2 m in length, ranging up to 11.2 m. In breadth they average 1.6 m, ranging up to 6.1 m.

The pits were analysed in a number of ways. Firstly, the size as judged by their plan areas was considered. The multiple of the length by the breadth was used as a measure of pit area. It is not quite exact as pits often have rounded corners and occasionally slightly curved sides and ends, making the actual areas smaller than this product. Figure 3 shows a smoothed frequency distribution curve for these pit sizes. As can be seen, the dominant modal size is about 3 m².

However, there are some pits which are many times this area. The distribution curve is bimodal, with a second group having a modal size of 12 m². A cut-off point of 10 m² has been used to separate these large pits from the rest. Beyond these there are three pits which are outliers to the distribution. These "super pits" are above 35 m².

Table 1 gives the occurrence of large and super pits in the six assemblages of pits considered.

The second approach was to look at the length to breadth ratios of the pits. Figure 4 shows a smoothed frequency distribution curve for these ratios. The main distribution of the sizes

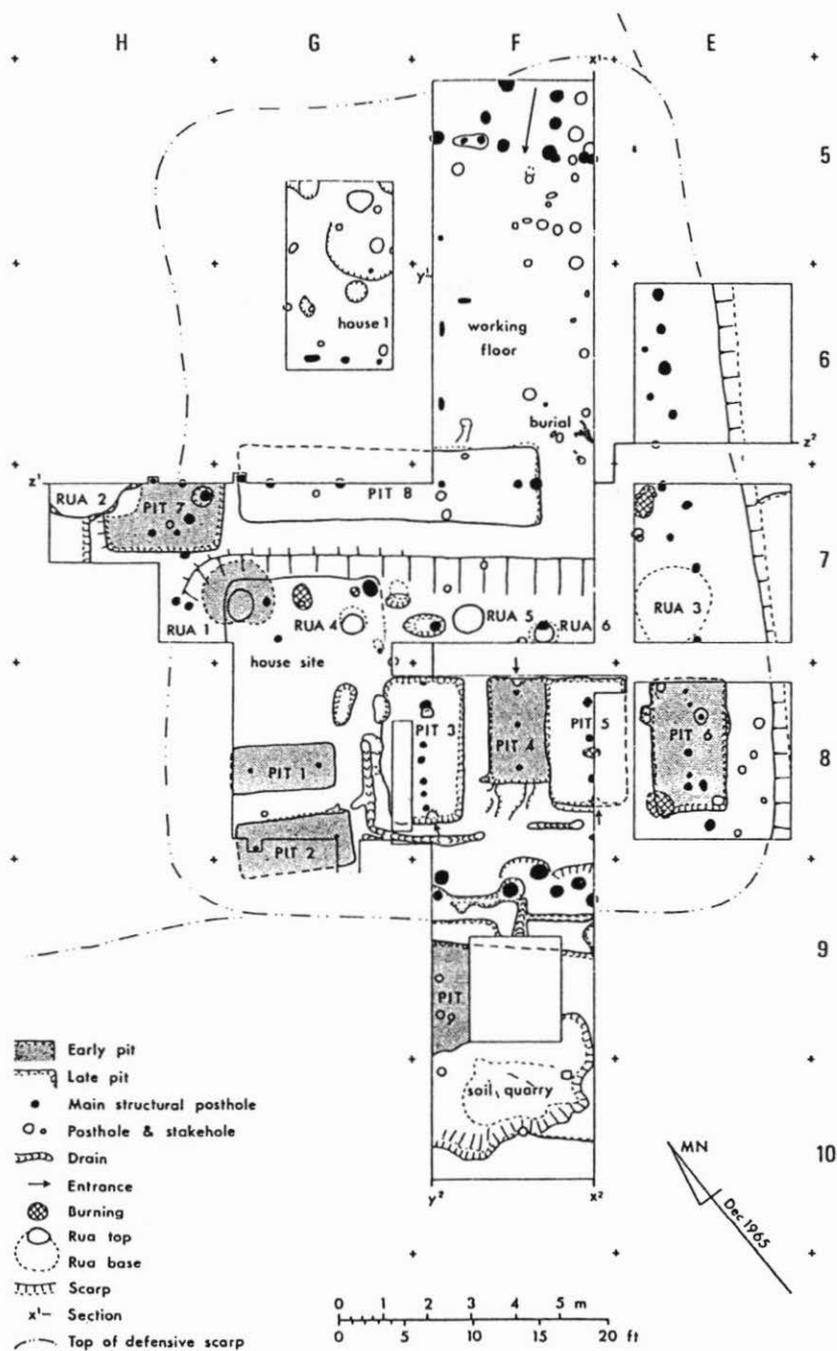


Figure 2: Part of the area excavated at Maioro, showing pits (from Fox and Green 1982: Fig. 8). Pit 8 is the long pit at this site.

is bimodal with two peaks at 1.8:1 and 2.3:1. This double peak may just be a statistical artefact of the population size. Pits of these two modal proportions appear in all of the six assemblages, so if there is any significance in the two modes it does not appear to be geographic.

As with pit size, there is a tail of outliers extending out to the extraordinarily long pit at Ongari Point. On the basis of this distribution curve, it was decided to distinguish long pits as having length to breadth ratios above 2.9:1.

Table 1 gives the occurrence of long pits in the sample. All of the assemblages have long pits. This is not surprising, as five of the assemblages were selected for study on the basis that they appeared to have long pits.

Figure 5 is a scatter plot of the pit lengths and breadths, with the pits of different categories as derived above differentiated. The super pits clearly stand out from the rest. Two of these are much closer to square than the usual pit proportions, but with such a small sample here it is dangerous to generalise. Some of the pits classified as long on the basis of the length to breadth ratio are not outstandingly long in their absolute length. However, as can be seen in Table 1, pits which are both large and long occur in all assemblages.

Another way of seeing how some pits stand out from the crowd is to plot the length to breadth ratio of each pit against a generalised statistic of size. This indicates how far each pit departs from the mean of each assemblage. These diagrams are shown in Figures 6 and 7. The statistic used for the departure is Mahalanobis D-squared distance, which takes both length and breadth into the measurement and corrects for correlation between length and breadth (Kendall 1975: 168). This correlation is typically quite high. For instance, for Kawerau the correlation coefficient r , between length and breadth, is 0.88. In calculating these statistics the lengths and breadths were log transformed. The D-squared distances are from the means of each assemblage rather than the overall means.

If the populations were normally distributed it would be expected that 5% of the pits in each assemblage would have a D-squared distance greater than a value of 6.0. The experience here is that 9 pits (8.1%) depart the average by more than a distance of 6.0. This cannot be used in this case in any rigorous way for the proof of outliers, because of the selected nature of the assemblages. However, the diagrams seem to be a useful way of looking at the outliers for size and shape for, as can be seen on Figures 6 and 7, the super pits and the long pits stand out from the others.

TABLE 1
Pit Type Frequencies

Site	Ordinary	Long and large	Other Long	Large, not long or super	Super	Totals
	-	-	-	-	-	-
Aotea	11	2	-	-	-	13
Kawerau	32	3	1	2	1	39
Kauri Pt Undef.	10	1	2	-	-	13
Ongari Pt	10	-	2	2	-	14
Maioro	6	1	-	-	1	8
Fisher Rd	10	1	-	12	1	24
Totals	79	8	5	16	3	111

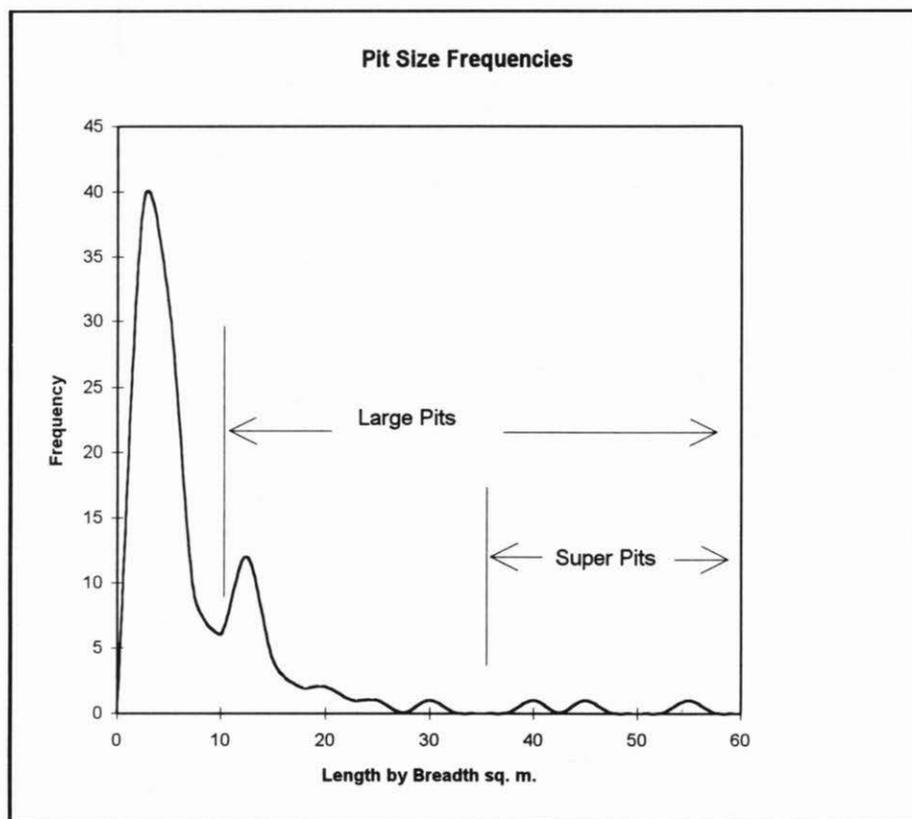


Figure 3: Pit size frequencies, smoothed frequency distribution. The sampling interval is 2.5 m².

A further site, not taken into this analysis, is worthy of mention. This is U14/2240 at Judea near Tauranga in the Bay of Plenty. An unpublished rescue excavation there by McFadgen (pers. comm.) uncovered a series of pits. Two fall into the long pit category defined here, a pit 7.6 m long with a length to breadth ratio of 5.4:1 and an extraordinary 16-m-long pit with a ratio of 10.7:1, higher than any in the study sample. The site is undated.

FUNCTION

The super pits recognised as a category here are, in the author's experience, encountered from time to time in the field. Indeed the pits considered here were in two cases excavated because they were visible as surface features.

In contrast to the super pits, the existence of the long pits was not generally obvious from the surface evidence. Although long pits can be taken as a defined type on the basis of the present study, an interesting aspect of their existence is that they have not been recognised as a type from the field evidence of thousands of pits which can be observed in the northern North Island. They are certainly rare. This negative evidence is based on the writer's own experience and on questioning of experienced field workers. This suggests that these pits were built in places where they were likely to be infilled again after use. On sites with occupation histories beyond a single phase, the deliberate infilling of pits is commonly found to have occurred. The reasons seem to relate to some limits to the life of a pit. Infection by the spores of fungi which might attack the stored crop has been suggested as a reason for not using pits for extended periods (Ambrose n.d.). However, the reason for backfilling is not important to the present discussion.

It is suggested here that long pits have been recognised only in excavations because they were associated with occupation sites rather than sites with a purely storage function. The ongoing occupation of such sites meant that the land occupied by the pits was required for re-use and so the pits were filled in.

Why then build long pits? A prosaic explanation might be that it was just a way of building a larger pit, but their differentiation in shape from other pits on the sites where they are found does not support this. They are not just an extreme of a distribution curve, as one would expect if they were simply large examples. They seem to form a different population.

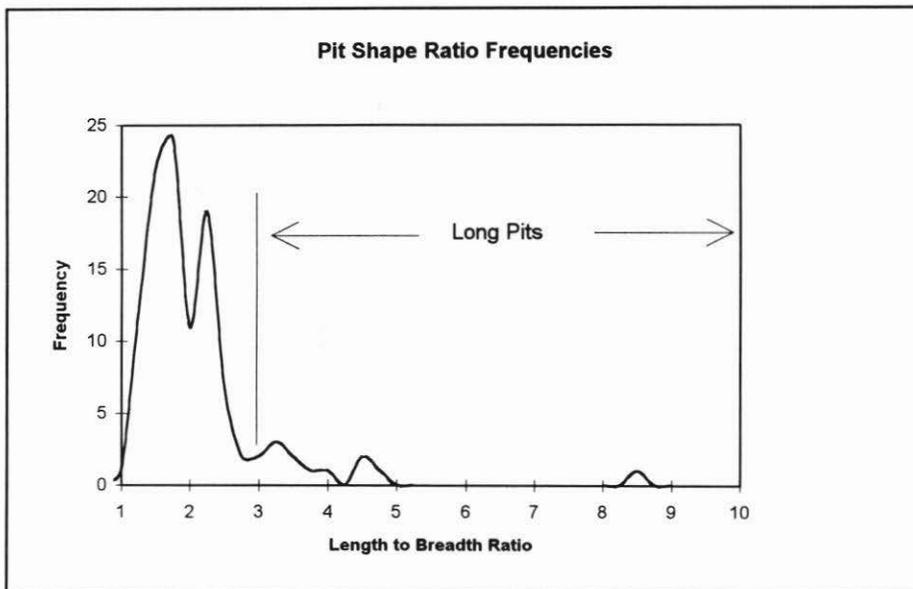


Figure 4: Pit shape ratio frequencies, smoothed frequency distribution. The sampling interval is 0.25.

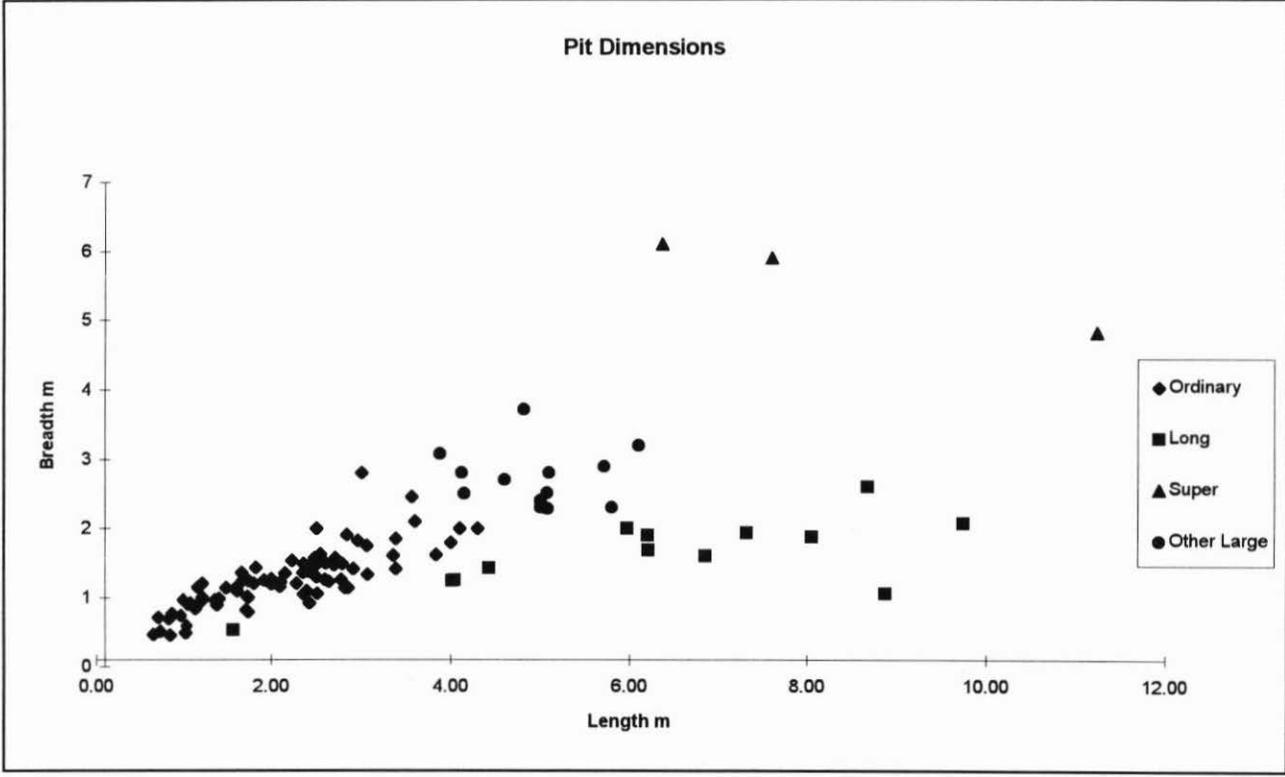


Figure 5: Length/breadth scatter plot of all the pits considered.

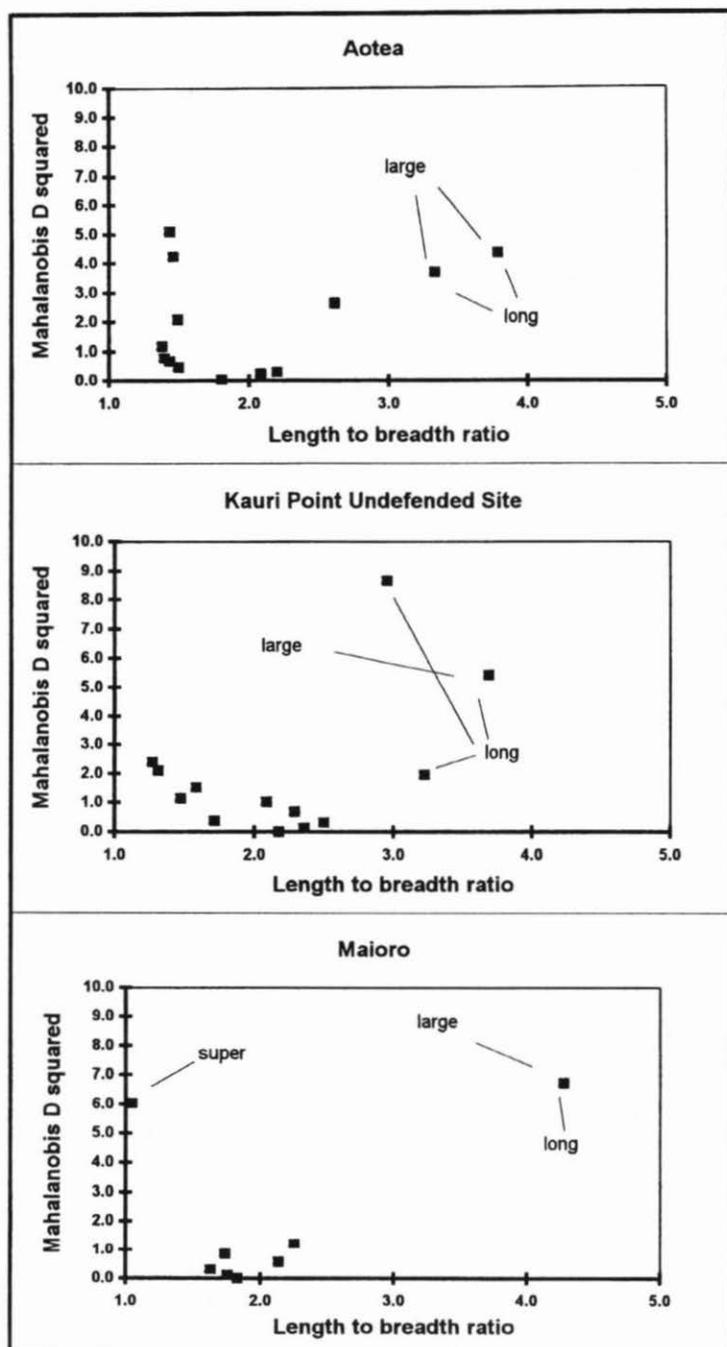


Figure 6: Diagrams showing the length to breadth ratio of each pit and the departure of each pit from the population norm at Aotea, Kauri Point undefended settlement and Maioro.

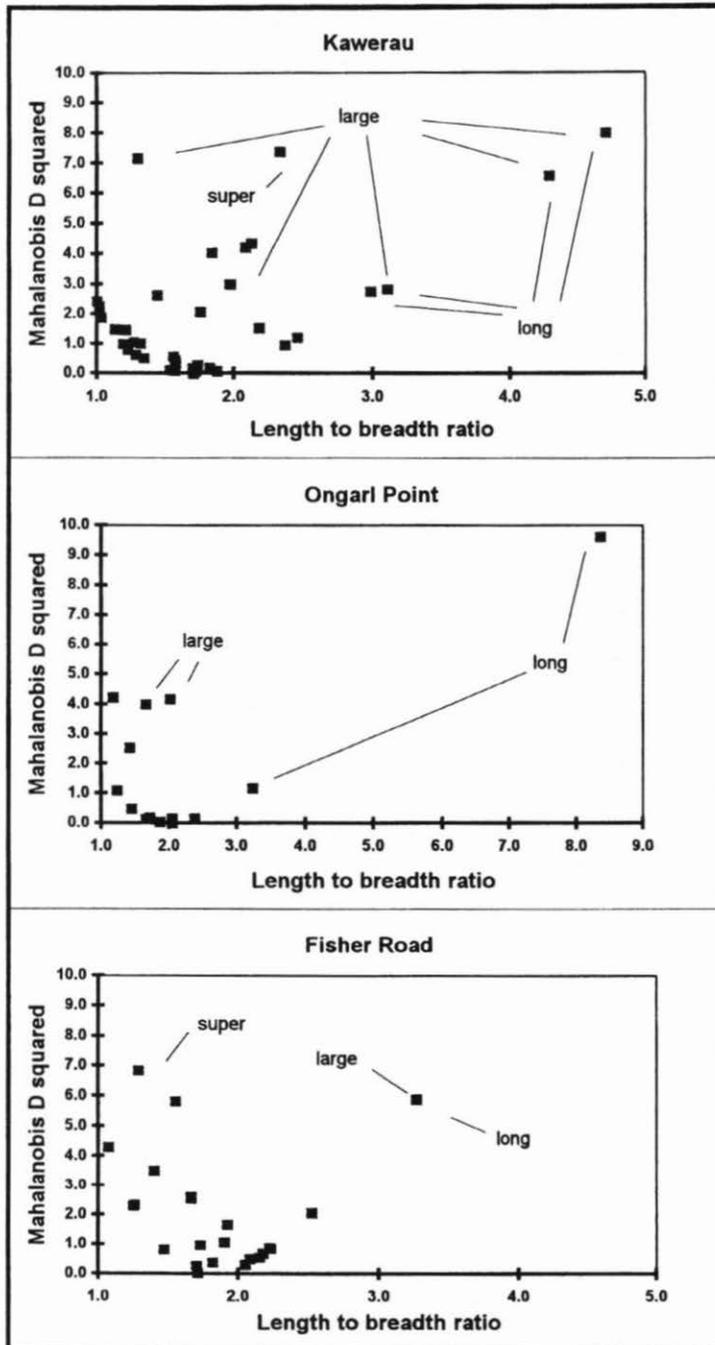


Figure 7: Diagrams showing the length to breadth ratio of each pit and the departure of each pit from the population norm at Kawerau, Ongari Point and Fisher Road.

Limited ability to span with a roof is not an adequate explanation for long pits. Māori pit and house builders spanned far wider spaces. The super pits are ample evidence of this. Nor are the long pits simply large pits. Although at Aotea and Kauri Point undefended settlement the long pits are the largest pits in the excavated sample, at Ongari Point, Fisher Road, Maioro and Kawerau they are not. There conventionally shaped pits are as large and larger in area (judged on length by breadth areas).

Did the sites constrain the shapes? There is no evidence for this at Ongari Point, Fisher Road or Kauri Point undefended settlement, where the sites are flat and the other structures do not appear to constrain the shape. At Kawerau, the excavator's view that they were an adaptation to the topography of the sites deserves to be carefully considered. The Aotea pits, too, are aligned along terraces. But there is nothing to stop conventional pits being constructed end to end to adapt to any site constraint. Indeed such a pattern of pit construction has long been recognised (Parker 1962) and is found at Kauri Point undefended settlement. At Maioro, the long pit is on a narrow space between a house and a scarp and may have been constrained if the house was built first (Figure 2). However, the other terrace at the same site indicates that there were other ways of arranging pits and houses which would have allowed the use of a more conventional pit shape.

Some form of progressive construction with backfilling behind could be considered, in which the pit in use would be of normal size, but there should be evidence within the backfill that this was the case and it has not been noted in any reported examples.

The credible explanation overall is that long pits were made that way because of cultural preference rather than being constrained in shape by physical considerations.

Storage of something other than *kūmara* also needs consideration. Long structures may have been needed for lengthy items. Canoes and nets are obvious examples of long items. Of the six sites, only Fisher Road and Ongari Point are immediately beside the sea, while Kawerau is quite distant. Net storage, then, is not a factor which can explain all these pits. The siting of the long pit in Ongari Point could not be less practical for canoe storage. Historical net and canoe stores were not subterranean. There is no obvious reason to build them so. *Kūmara* storage is the most likely use for these pits.

The combination of construction in those proportions by choice and the argument that the form was not commonly used away from occupation sites suggests that the pits were shaped that way for a social purpose. The most obvious explanation is that a long pit would make a greater display than would a conventionally shaped pit. A pit twice the length of another is more impressive than one where all the dimensions (length, width and depth) are increased by 26%, yet each is an effective doubling of the volume below ground. It is proposed here that some pits were built in this elongated form for social display rather than just increased capacity.

Displays of wealth are used by many societies. Displays of consumable wealth such as food are also common. It is of interest that the six sites considered here are all in areas of the northern North Island with climates and soils particularly favourable to *kūmara* cultivation. Such areas, of course, are the most likely to be able to produce crop surpluses for display, feasts and use in reciprocal exchanges.

What then of the large pits? There are pits in the assemblages which are more than ten times the modal size of the pits overall. It might be suggested that pit size was related in some way to variability in the production of surpluses, but it stretches credulity to think that the harvest could be so variable. A more likely explanation is that large pits represent a different approach to storage than the more normal sized pits. A large pit may have offered a better opportunity for the progressive utilisation of the crop than a smaller pit because of

greater ability to accommodate access ways through the pit. These large pits must represent co-operation in production among a reasonably large group of people.

That is not to deny that a collection of small pits may have been produced by a group of similar size who chose to store in multiple rather than single pits. With many small pits, re-distribution of the crop could have been by allocation of separate stores to smaller kin groups. Certainly if the storage was in a large pit the task of allocation would be an ongoing one for a larger group and would require greater social cohesion. Prestigious displays in which the community can share are a means of reinforcing social cohesion. It is therefore suggested that the large pits, too, reflect a desire to make a display of the wealth and cohesion of the communities that built them. These large pits are found in sites where there are also more ordinary sized pits. It is not known if the different sizes are strictly contemporary. It is possible that a community put only part of its product into a store in community control. Alternatively, the large pits may have been used to the exclusion of small pits in years when the community needed to enhance its prestige.

The archaeological features considered here are related to prestigious food — that grown by the gardeners, proverbially the people of lasting fame, as opposed to the warriors whose fame was short lived. The food here is not for immediate consumption but still can be viewed within the same set of cultural values. The storage requirements of *kūmara*, requiring warmth of the ground and humidity, mean the storage structures had to be pits. Pits impose some limitations on how they can be used to display a wealth of harvested food. They cannot be prominent in height without breaking the crucial connection to the ground environment. They can, however, be made large or long in plan to give some of this effect. Any associations these pits may have with status differentiation within settlements or with other structures linked to prestige are not apparent from the evidence reviewed. There is potential here for further study.

This study suggests that buried in our soils there may be new ways of investigating the development of food surpluses in Māori society and perhaps the reciprocal interactions using those surpluses.

AGE OF THE PITS

Aotea has little evidence of time span in the cultural deposits. Four radiocarbon estimates cluster on 400 BP (Fox and Cassels 1983: Appendix 3). Hence a sixteenth century age is likely for the site. The Kawerau sites have a series of seven radiocarbon ages ranging from 336 BP to 520 BP (Lawlor 1983: 225, Waikato Radiocarbon Laboratory Internet database). One of the long pits is in a site (V16/220) dated by two determinations of 360 ± 55 and 520 ± 80 BP. Inbuilt age on the first sample is likely to be small and a sixteenth century date is probable. The large, but not long, pit has been directly dated by a determination of 350 ± 55 BP (on tree fern trunk charcoal which will have small inbuilt age) and there is a date of 370 ± 55 BP (on *kānuka* charcoal *Kunzea ericoides*) from the infill of the pit (Site V16/219). Again, inbuilt age should be small and a sixteenth century date is likely.

A single age estimation of 470 ± 70 BP is available for Kauri Point undefended settlement (Green 1978). The date is on charcoal without identification as to tree species, so will have some inbuilt age, but a date earlier than the eighteenth century is likely. No dates have been published for Ongari Point but this site clearly had a lengthy occupation. Shawcross assigned both of the long pits to the second oldest phase of the five he recognised on the site.

Maioero has a series of dates which Green (1983) summarised as indicating a thirteenth century initial open settlement followed by a fifteenth century palisaded *pā*. He argues that the large pit at this site is from the early period. The long pit is from the later occupation. The two Fisher Road sites have a series of four dates clustered on a little under 400 BP (Foster and Sewell 1989). The excavators opt for a date of mid to late sixteenth century.

The variety of detail that *kūmara* storage pits contain must mean that some features have a limited time span and may be discrete time markers. Do either large or long pits have this potential? Large pits may date from as early as the thirteenth century, were certainly in use in the sixteenth and may well have continued later. They appear then to be a long-used form. On the other hand, long pits could be characterised as a sixteenth century form on the basis of existing dates. A more conservative view, given the uncertainties of radiocarbon dating, would allow a century on either side. This is not to deny the possibility they may have been used over quite a limited time. The absence of later dated long pits, their use earlier but not later in the sequence at Ongari Point, and their absence as surface features in field surveys suggest that they were not used much later than the sixteenth century.

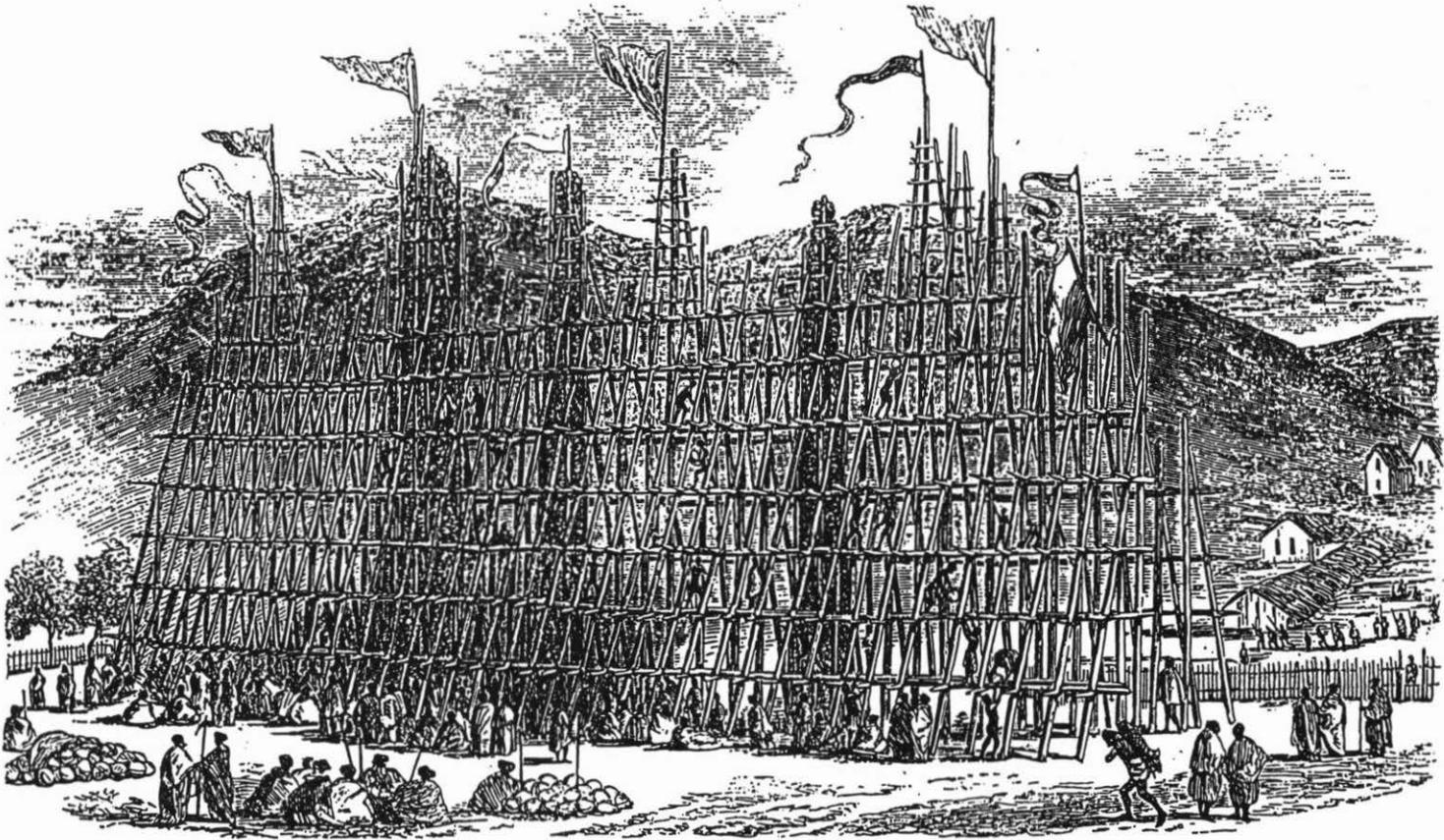
FOOD DISPLAY IN LATER MĀORI SOCIETY

Feeding of guests is a long standing aspect of Māori culture. The prestige of a community is influenced by the character and quantity of food it supplies to its guests. Making displays with food was a feature of nineteenth century Māori society in northern New Zealand. The Māori word *hākari* refers to a feast, but also to a high wooden framework on which food was displayed as part of the event. Yate (1835: 39) illustrates such a stage and sets the display of food in the context of reciprocal hospitality. Some of the food displayed was for removal by the guests on their departure rather than for immediate consumption. The stage illustrated by Yate is axially symmetrical and depends in part on its height for its effect.

Thomson (1859: Vol. II, frontispiece, see Fig. 8 in this paper) illustrates a stage built in the Bay of Islands. This illustration may well be derived from a sketch by C.C. Clarke now in the Turnbull Library (see Brown 1988: 83 for illustration). This stage is linear in form and depends for its effect on its height and length as well as on flags flown from its top. Stages like these, associated with feasts, are reported for northern New Zealand by Cruise in 1820 (Cruise 1957: 83) and Servant in the 1830s (1973: 23, 68).

Other prominent structures associated with food in nineteenth century Māori society are well known. *Pātaka*, raised carved storehouses, are clearly displays of wealth in the extravagance of decoration beyond utilitarian need. Other valuable goods as well as prestigious foodstuffs were stored in *pātaka*. More common food storage stages, *whata*, were often illustrated in the early and mid nineteenth century. They are often shown as having a height which must exceed any functional need in their separation from the ground. Their presence in such a prominent form would have been effective in displaying wealth in stored food. Interestingly, the word *whata*, used as a verb, has an additional meaning of to bring to prominence, protrude and stand out.

Linear displays of foodstuffs without supporting structures also occurred at early nineteenth century feasts. Polack (1838 (I): 229) describes a feast with food laid out in two rows forming a lane. Markham (1963: 49) observed a feast with 4,000 bags of potatoes, stacked three bags high in a long line. Taylor (1855: 169) describes long walls of *kūmara* topped by roasted pigs as a display at a feast.



STAGE FOR HAKARI OR FEAST GIVEN TO GOVERNOR GREY IN 1819 AT THE BAY OF ISLANDS TO CELEBRATE
THE PEACE BETWEEN THE TWO RACES.

Figure 8: A hākari food display stage, from Thomson (1859, Vol. II, frontispiece).

Other wealth was put in linear arrays. A feast given in Remuera by Potatau Te Wherowhero in 1844 had an array of food reported to be a mile long, but also blankets intended as presents for guests displayed as a linear fence (Angas 1847 (I): 319). The scene was illustrated by J.J. Merrett (reproduced in Platts 1971: 94).

Such displays seem to fade from the record in the later nineteenth century, perhaps reflecting the impoverishment of Māori society, or possibly new concepts about the healthy handling of food. A late nineteenth century building may have an echo of such displays. It is a *whare kai* built at Te Pahou in the Bay of Plenty to seat 400 people for a visit by the Governor. It is in the form of a very elongated shed of one table width. It was photographed by Winkleman in 1899 and illustrated in Edwards (1987: 43).

Salmond notes that while holding of *hākari* feasts for purely prestigious reasons has not persisted into modern practice, feasts are still held as a part of all gatherings (*hui*). Reviewing historical accounts of *hui*, she concluded: "Despite these changes in emphasis and detail, however, the *hui* described by early observers is recognisably the forerunner of the *hui* today" (Salmond 1990: 18).

While open air displays of food no longer occur, providing sustenance to guests on a *marae* remains a vital part of contemporary Māori culture. Not attending to this would be a matter of embarrassment and shame (Salmond 1990: 105; Dansey 1971: 40). Reciprocation is an expectation. The foodstuffs served would be a subject of conversation between returning guests and those who were not present (Buck 1950: 378).

Unlike modern Pakeha banquets, the dining tables in modern dining halls on *marae* are laden with some of the food, decoratively arranged, before the guests are seated. The tables are set end to end in rows, often aligned down the long axis of the dining room, giving an emphasis to length.

It may not be not stretching credibility too far to see a linkage through time from long *kūmara* storage pits, through *hākari* food displays, to the way food is presented in contemporary *whare kai*.

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