

Archaeology of the Bay of Plenty



Department of Conservation
Te Papa Atawhai

Archaeology of the Bay of Plenty

Garry Law

Published by
Science & Technical Publishing
Department of Conservation
PO Box 10420, The Terrace
Wellington 6143, New Zealand

Cover: Old sulphur mine with HMNZS *Mako* in the background, White Island, 1960.
Crown copyright: Department of Conservation *Te Papa Atawhai*.

Individual copies of this book are printed, and it is also available from the departmental website in pdf form. Titles are listed in our catalogue on the website, refer www.doc.govt.nz under *Publications*, then *Science & technical*.

© Copyright June 2008, New Zealand Department of Conservation

ISBN 978-0-478-14429-1 (hardcopy)
ISBN 978-0-478-14430-7 (web PDF)

This text was prepared for publication by Science & Technical Publishing; editing by Lynette Clelland and layout by Amanda Todd. Publication was approved by the Chief Scientist (Research, Development & Improvement Division), Department of Conservation, Wellington, New Zealand.

In the interest of forest conservation, we support paperless electronic publishing. When printing, recycled paper is used wherever possible.

CONTENTS

Abstract	5
<hr/>	
1. Introduction	6
<hr/>	
2. Scope	6
<hr/>	
3. Sources of information	8
<hr/>	
4. A short history of settlement	10
<hr/>	
5. Natural history of the Bay of Plenty area	13
5.1 Geographical and geological setting	13
5.2 Volcanic and tectonic activity	14
5.3 Erosion and deposition periods	18
5.4 Coastal stability and processes	19
5.5 Stone resources	21
5.6 Soils	22
5.7 Vegetation	22
5.8 Terrestrial fauna	24
5.9 Marine fauna	25
5.10 Freshwater fauna	25
<hr/>	
6. Anthropology in the Bay of Plenty	26
<hr/>	
6.1 Ethnography	26
6.2 Traditional history and archaeology	27
<hr/>	
7. Chronological issues	29
<hr/>	
8. Resource use	31
<hr/>	
8.1 Maori resource use	31
8.2 European resource use	37
<hr/>	
9. Maori settlement pattern and character	40
<hr/>	
9.1 Archaic occupation	40
9.2 Later prehistoric occupation	43
<hr/>	
10. Specific areas	59
<hr/>	
10.1 Athenree/Katikati	59
10.2 Ruahihi	64
10.3 Matakana Island	65
10.4 Papamoa	68
10.5 Kohika	71

11. Historical archaeology	73
11.1 Contact period	74
11.2 The ‘Musket Wars’	76
11.3 New Zealand Wars	79
11.4 Colonial settlement	83
12. Conclusions	98
12.1 Summary	98
12.2 Research issues and opportunities	100
12.3 Constraints to research	102
13. Acknowledgements	103
14. References	103
15. Glossary	121
<hr/>	
Appendix 1	
Site surveys	123
<hr/>	
Appendix 2	
Recorded archaeological excavations	126
<hr/>	
Appendix 3	
Radiocarbon dates	130
<hr/>	
Appendix 4	
Faunal associations	141
<hr/>	
Appendix 5	
Cultural tourism and archaeology in the Bay of Plenty Conservancy	143

Archaeology of the Bay of Plenty

Garry Law

PO Box 87311, Meadowbank, Auckland 1742, New Zealand
Email: glaw@lawas.co.nz

ABSTRACT

This report summarises the state of knowledge of the archaeology of the Bay of Plenty, New Zealand, and reviews research themes and priorities of the past and for the future. The Bay of Plenty is favoured as a place to live today, but this has not always been the case. Its first settlement by Maori seems to have been sparse, whereas there are numerous sites from the later pre-European occupation period. The early economy was based around the marine resources and soils, which were well suited to cultivation of kumara. The first European visitors took relatively little interest in the region as it generally lacked the gold and accessible timber resources that drove early growth elsewhere, and cobalt-deficient soils made pastoral farming unattractive in much of the area. The development of improved transport resulted in greater growth, and pastoral farming increased as the lowlands and swamps were drained. In the second half of the 20th century, exotic forestry, energy and horticulture were the main drivers of growth in the region, which now has a rapidly increasing population. All of these stories are illuminated by the archaeology of the region, and there is great potential to tell more. To do this, research strategies and plans need to focus on gaining a better understanding of Maori settlement and resource use away from the coast, examining the factors leading to the widespread adoption of pa from about AD 1500, and making better use of the archaeological material arising from mitigation excavations of Maori sites. Comprehensive recording of historic archaeological sites is also needed.

Keywords: archaeology, Bay of Plenty, Rotorua, Tauranga, Whakatane, Maori, settlement, resource use, mining, forestry, transport, energy

1. Introduction

The Bay of Plenty, in the northern North Island of New Zealand, seems to be a particularly well-favoured region today, with its mild climate, fertile soils, good energy availability, and its attractive coastline, inland lakes and rivers. However, it has not always seemed as such to human settlers. Volcanic eruptions, extensive wetlands, poor access, sparse mineral wealth, a lingering war and soils deficient in a key trace element (cobalt) hindered its use until quite recently.

Archaeological study can elucidate the history of the region, from its earliest Maori settlement and through the phases of development that followed their arrival and the arrival of the first Europeans.

For archaeological sites of Maori origin, there is a fairly comprehensive set of data available. Some outstanding work has already been done, but additional and better work is required in some areas. This report summarises what is known and indicates where more knowledge is needed.

There is a much smaller body of archaeological work for the historic period (after the arrival of Europeans). This report compares the small amount of survey work that has been undertaken with the extensive potential for further work, as indicated by the written historical record.

2. Scope

This report summarises the state of knowledge of the archaeology of the Bay of Plenty Conservancy of the Department of Conservation (DOC). Research themes and priorities of the past and for the future are reviewed. The intention was not to undertake new fieldwork or research.

The boundary of the conservancy includes the offshore islands Mayor Island (Tuhua), Motiti, White Island and Moutohora (sometimes called Whale Island) (Fig. 1). On the mainland, the boundary of the study area starts just east of Ohiwa Harbour and follows a catchment boundary until the Urewera Park boundary is met. It then follows the western side of the Park south until State Highway 5 is met, at which point it follows State Highway 5 back towards Taupo. Before Taupo, it diverts along minor roads to the Waikato River at Broadlands. The boundary then follows the Waikato River to Atiamuri, follows State Highway 1 through Tokoroa and Putaruru, and then diverts on to the Waihou River. It leaves that river boundary near Paeroa to follow the northern boundary of the Kaimai/Mamaku Park until it reaches the sea. The area includes the reserve land north of Waihi Beach.

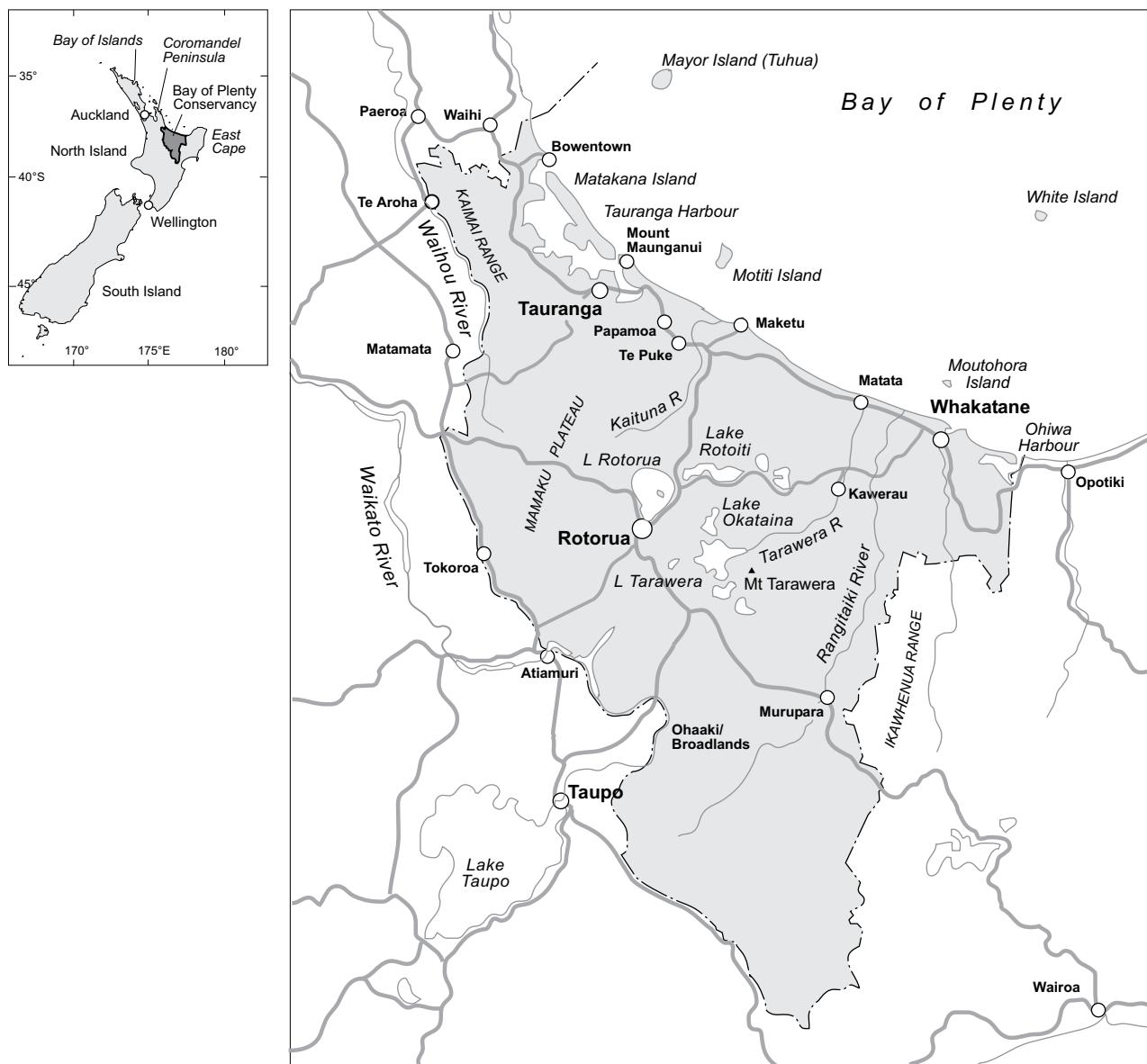


Figure 1. Bay of Plenty Conservancy, Department of Conservation.

The boundaries of the conservancy are not particularly satisfying either from a cultural or topographic perspective, but more or less follow the Bay of Plenty region as it is conventionally understood. In Maori terms, the boundaries cut across several rohe (tribal boundaries). In modern administrative terms, the area includes only the western part of the Bay of Plenty Regional Council, and includes all of Tauranga, Western Bay of Plenty, Kawerau and Rotorua local government areas but only parts of several more. Only parts of the Coromandel goldfields are included. Topographically, the area includes only some of the islands in the Bay from Coromandel to East Cape, and only some of the inland volcanic landscape.

3. Sources of information

TABLE 1. TOTAL NUMBER OF SITES RECORDED IN THE BAY OF PLENTY AS AT 2002.

SITE	NUMBER
Maori	7905
Non- Maori	354
Total	8259

This study has largely drawn on the site record files in the New Zealand Archaeological Association (NZAA) Site Recording Scheme, published reports and the large corpus of unpublished writings about the area.

The region falls into six filing districts of the NZAA scheme. No file area is entirely within the conservancy, but the Bay of Plenty file covering New Zealand Map Series 260 sheets U13-16, V13-18 and W13-16 has by far the greatest proportion of sites. As at February 2002, there were 8259 sites recorded in the conservancy area (Table 1).

Appendix 1 gives details on the site recording that has been undertaken in the past and more information can be found in an unpublished working paper for this project (Law 2002a). The dominance of Maori sites in site records is artificial, as much less effort has been made in the systematic recording of historic (since the arrival of Europeans) archaeological sites.

Many sites have been excavated in the region. Appendix 2 lists the more significant of these. Almost all are Maori sites. Sites where more information may be available are listed in an unpublished working paper prepared for this project (Law 2002b). Reports of excavations on these sites are of particular value. Many of the excavated sites have been dated by radiocarbon dating. These dates are given in Appendix 3, and the distribution of sites through time is discussed further below.

There is a large volume of archaeological literature for the area. More than 80 pages of archaeological and historical references were collected in the course of this study. The majority of archaeological references are of the type that is often described as being 'grey' literature; that is, mostly unpublished reports of which only a few copies exist. This sort of information varies considerably in its value to a researcher. Some reports have quite modest aims; for example, being prepared for a developer who was required to report if there were any archaeological sites likely to be affected—often there were not any. In contrast, reports of mitigation excavations or major surveys are much more important. While formally published material dominated entries in the bibliography in the mid-20th century, by the end of the 20th century this had shrunk to 5% of entries and unpublished or 'grey' literature predominated. Such literature is not easy to access. Material was sourced from the Wellington and Tauranga offices of the New Zealand Historic Places Trust, the Rotorua and Wellington offices of the Department of Conservation, filed with the Bay of Plenty, Coromandel, Waikato and Taupo New Zealand Archaeological Association site records, and, in a few cases, directly from authors. No one place has comprehensive holdings.

Despite the amount of work available, there is no definitive publication on the archaeology of the area and a dearth of monographs reporting the findings from key excavated sites. Irwin's 'Kohika' (Irwin 2004) is the exception. Green's 'Review of the prehistoric sequence of the Auckland Province' (Green 1963a) covered some sites in the west of the region but is now dated and does not cover the vast bulk of more recent work.

There is a number of significant theses and postgraduate degree research essays written about the area, principally from the University of Auckland, that deal with both *prehistoric*¹ (in New Zealand terms, the period before European contact) and historic (after European contact) archaeology (e.g. Holroyd n.d.; Edson 1973; Boileau 1978; Lawlor 1979; Walters 1979; Williams 1980; Kahotea 1983; Spring-Rice 1983b; Mitchell 1984; Seelenfreund-Hirsch 1985; O'Keeffe 1991; Petchey 1993a; Palmer 1994; Phillips 1996). However, the lack of resident archaeologists with an academic base undertaking research that is not driven by development or site management needs has limited the recent development of archaeology in the Bay of Plenty.

Enthusiastic local historians have created a detailed record of the settlement and development of the Bay of Plenty since European settlement. While little of this is directly archaeological, they provide rich sources of material that can be related to the historic archaeological landscape when it is more fully explored. The long-running journal of the Whakatane and District Historical Society—‘Historical Review’—is a prime source for this and local archaeological interest. Local historian Don Stafford’s many publications on Rotorua are a mine of detailed information, and geographer Evelyn Stokes’ works on the Tauranga area (particularly ‘A history of Tauranga County’; Stokes 1980) have an immediate appeal to an archaeologist with their integration of social issues into the landscape.

Not many local histories from anywhere in New Zealand start with a sound exposition of the archaeology of the region. Ken Moore’s ‘Kawerau, its history and background’ (Moore 1991) is an exception, bringing in the knowledge of a resident with a long-sustained interest in archaeology.

Early historical resources are less common in the Bay of Plenty than in some other parts of New Zealand. The mission station histories for Te Papa, Tarawera and the Rotorua sites are the exceptions (Vennell 1984; Andrews 2001; Grace 2004), as is the history of the Maketu trading operation of Tapsell (Cowan 1935). More problematic is the novelised account of Valentine Savage’s life at Matata in the 1840s (Henderson 1948), where the detail is credible but some may be later additions. There are biographies of three important missionaries, Thomas Chapman (Andrews 2001), Thomas Samuel Grace (Grace 2004) and Alfred Nesbit Brown (Hall 1981), as well as brief accounts of the lives of the important soldier-settlers William and Gilbert Mair (Andersen & Petersen 1956) and a biography of Gilbert Mair (Crosby 2004). Some early travellers passed through Tauranga and the Rotorua Lakes and geothermal region—notably, Percy Smith (1953) in 1858, Hochstetter (1867) in 1859, Meade (1870) in 1864/65 and Dieffenbach (1843) in 1841—but their accounts reflect the itinerant and brief nature of their visits. Few illustrations appear until the arrival of the British troops at Tauranga. Kinder’s watercolours and photographs from several visits from 1858 to 1964, covering Tauranga, Rotorua and Tarawera, are a valuable source (Dunn 1985). Robley’s portraits and scenes from the 1864 war constitute a treasure-trove of pictorial depictions of the early historical period (Robley 1896; Melvin 1957, 1990).

¹ See Glossary for definition of this and other italicised terms.

Some significant archaeological work has been carried out just outside the boundaries of the Bay of Plenty Conservancy. Much archaeological work has been done on the Coromandel Peninsula, although there are no recent summaries (but see Law 1982). More recent reviews of the archaeology of Hauraki (Furey 1996; C.A. Phillips 2000) are very relevant to the western parts of the region. A rare example of an inland early site—the Tokoroa moa-hunter site (Law 1973)—is just outside the region, as is the early Whakamoenga Cave site (Leahy 1976). The excavations around Taupo that were prompted by the Tongariro power scheme (Newman 1988) are also relevant.

Part of the Coromandel goldfields are within the conservancy area and their development was influential within the district. The knowledge of these has most recently been summarised in visitor guide form by Moore & Ritchie (1996).

The author has been a participant on a few of the excavations in the district and has visited many sites over recent decades. Therefore, fieldwork for this report was limited to becoming familiar with some historic sites of European origin not previously visited.

4. A short history of settlement

Before introducing the detailed part of this account, it is worth summarising the settlement history of the Bay of Plenty area.

Several of the traditional canoes, or waka, that brought the first Maori settlers to New Zealand are associated with the Bay of Plenty. The traditional landing places of the Takitimu, Mataatua, Te Arautauta and Nukutere waka are in the Bay of Plenty region. Indeed, considering the trajectory of voyagers from eastern Polynesia, a good proportion of landfalls would naturally be expected in the Bay.

The early Maori settlers were highly mobile and drew on the resources of a wide area of the country. The obsidian of Mayor Island (Tuhua) is an example of a Bay of Plenty resource that has been found widely through New Zealand in early Maori occupation sites. The earliest occupants exhibited clear preferences in the sites they occupied. Most preferred were sites with access to the open ocean but with sheltered landing places, just within harbours or estuaries, where fresh water, firewood and, no doubt, the food resources of land and sea were readily available. The earliest settlements in the Bay of Plenty followed this pattern. However, the occupation evidence is not as extensive as might be expected for an area settled so early in Maori history.

The lifestyles of later Maori occupants differed considerably from those of the early settlers, with defence and food sources additional to those of the open ocean, including from horticulture, taking a greater role. As the population increased, the land became occupied by many descent groups who contested the resources of the area with each other and outside rivals.

The Bay of Plenty was not a centre of visitation by the first European explorers. To some extent, this may have been accidental. Captain James Cook visited the Bay only once, on his first voyage in the *Endeavour*. Before this, he had landed in and named Poverty Bay, so the name ‘Bay of Plenty’ was given in contrast to that, after observing its substantial population as he sailed along its eastern part. However, he never landed, so this name was a presumption of plenty rather than one based on close observation.

The *Endeavour* was followed by a large sail-driven double canoe along part of the Bay, and was vigorously challenged by its occupants (Moore 1965). This challenge was vividly captured by an artist on the ship, variously held to be Parkinson or Spöring. Cook saw a large settlement at Maketu, which he called Town Point, but the *Endeavour* was then blown out to sea in a gale and he never saw the Bay’s best harbour at Tauranga. Cook’s later stopping places in the north—Mercury Bay, Thames and the Bay of Islands—became much revisited by others, but Tauranga never gained this prominence.

The lack of accessible timber at Tauranga—the result of land clearance by the large Maori population—meant that one of the early trading opportunities was missing and shore whaling efforts and sealing were centred elsewhere in New Zealand. The large Maori population eventually attracted missionaries and traders, but this occurred later than in some other coastal areas of New Zealand. Flax (harakeke, *Phormium* spp.) was a resource where the Bay of Plenty had an advantage, and this featured in Maori trade and later Maori and European industry. The political turbulence of the area during the period of the Musket Wars from 1818 through to the 1830s may have been a disincentive to European settler interest. The seizure and burning of a trading vessel, *Haws*, in 1829 at Motouhora by local Maori, may have established a perception that the Bay of Plenty was not a safe area to trade (Wilson 1906: 31–32), as would have the ongoing warfare at Tauranga through the 1820s and 30s, where there were raids by Arawa, Ngati Maru and Ngapuhi.

Little land in the Bay of Plenty was alienated to Europeans before the New Zealand Wars. Maori in the area took part in the expansion of agriculture and trade during the 1840s and ’50s, owning vessels that took their produce to Auckland. A few British troops were stationed in the area as part of the post-1840 presence of the Crown, and they remained for a period to help contain the ongoing tension between Te Arawa and Ngaiterangi of Tauranga, until peace was established between those long-standing combatants in 1845. The long-standing alliance of Tauranga Maori with Waikato Maori led to Maori of the Tauranga area being perceived by settlers elsewhere as a key part of the Waikato-centred King Movement challenge to the British Crown. In reality, there was division amongst Tauranga iwi on the issue. However, as a result of this perception by Europeans, the land of Tauranga Maori was an early target for land confiscation. Some Maori from the Bay of Plenty were among the defenders of Rangiriri during the Waikato invasion of 1863, but seem not to have had any further involvement after that defeat. However, Tauranga was seen as a source of supply to the belligerents in the Waikato. Legislation to legitimise the confiscation of land, which was passed before the Waikato invasion, included Tauranga as a place where the Act would apply; thus, the lines were drawn by the colonial administration before the events of the war developed. The consequence of this was that late in the Waikato

campaign the colonial Government sent troops to Tauranga to challenge the Maori there. In some ways, the challenge mirrored that made to Cook almost 100 years earlier, but with the tables of power turned (Belich 1988: 177).

The eventual military defeat of the Tauranga Maori in 1864 led to land confiscation and land purchase, the latter under circumstances where the parties were scarcely equal. The land was allocated to soldier settlers, marking the beginning of European settlement in the Bay of Plenty.

The New Zealand Wars continued to afflict the Bay of Plenty for many years. For example, Arawa supported the colonial Government against the *Kingites*, where their traditional Tainui enemies had a large role. This position was beneficial to them in the early construction of roads and other communications, in the development of the Rotorua tourist trade, and in national Maori leadership. It is no accident that as late as the mid-20th century Arawa had a large role in the leadership of the Maori Battalion.

The growth of the European settler society was slow in this region, as there was little gold, the harbours were mostly only suitable for small vessels, timber resources were not readily accessible and the soils needed draining or fertilising to give a good yield. Some organised settlements did occur, however, two of which had an Ulster connection. The growth of the Bay of Plenty that gives its name a modern reality has largely occurred in the second half of the 20th century.

The archaeology of the Bay of Plenty has much to tell us about the early and later settlement of the area by Maori, about the Musket Wars as they affected the area, the early missionaries and traders, the New Zealand Wars, and the largely 20th-century expansion of industry and communications.

5. Natural history of the Bay of Plenty area

5.1 GEOGRAPHICAL AND GEOLOGICAL SETTING

The major topographical feature of the Bay of Plenty area is the broad sweep of sandy coast, including a barrier island (Matakana) and several sand spits. Beyond this coast are small offshore islands, and behind it are tidal harbours and estuaries. There are also coastal plains, some poorly drained. In places, *terraces* behind the coast rise to higher, more broken country. One major river—the Rangitaiki—drains through the region and the area is bordered for a short distance by the North Island's largest river—the Waikato. There are a number of large lakes in the Rotorua area, some with no formal outlet, although two rivers—the Tarawera and Kaituna—drain the area. The extensive Kaingaroa and Mamaku plateaus often have high scarp at their borders and at the margins of their internal drainage. The Waihou River plain lies west of the uplifted and rugged Kaimai Range to the west of Tauranga. Mount Tarawera, at 1111 m, is the highest topographical feature, although the Kaimai Range in the northwest of the area and the Ikawhenua Ranges to the east are almost as high.

The climate delivers warm summers and mild winters. Frost occurs inland. Annual sunshine hours exceed 2400 h on the coast but are lower inland. Annual rainfall exceeds 1200 mm; this is weighted towards winter, but the region rarely suffers from drought. As with the rest of the northern North Island, tropical storms occur occasionally in summer, with destructive high winds and unseasonal heavy rain. Over much of the inland catchment, free-draining soils allow high rainfall infiltration. This and the moderating influence of the Rotorua Lakes on flows means the rivers are not particularly prone to extreme floods.

Some particular geological features underpin the human history of the area and the archaeological evidence as it presents to field workers. In particular, much of the region is within the Taupo Volcanic Zone. This volcanic zone occurs where the Pacific plate subducts under the Australian plate and has reached sufficient depth for the subducting plate to commence melting. The consequence of this is volcanism and geothermal activity in a band parallel to the axis of the subduction zone. The point at which the plate descends is thought to have moved progressively eastwards, meaning that the evidence of earlier volcanic activity is found towards the west. The silver and gold mineralisation in the Kaimai and Coromandel Ranges resulted from geothermal water movement that was related to earlier stages of this volcanism. Rifting is also occurring in the zone, but the lowering of the land level associated with this is being offset by volcanism.

The effects of volcanism dominate the landscape of the Bay of Plenty area. Structures of domes, collapsed calderas, and later cones and domes within calderas are common through the zone. All of the offshore islands are volcanic, and the Rotorua Lakes are the product of volcanic activity. Active geothermal

areas are present, which are expressed at the surface as hot springs, mud pools, etc. Sulphur deposits are associated with some of the volcanism.

In addition, volcanism has resulted in frequent deposition of airfall volcanic ash (tephra). The soils that develop on tephra are free-draining and often have good fertility, with the exception of those originating from the Taupo eruption. In the Whirinaki area in the southeast, the folded sedimentary rocks that mark the plate boundary commence, with broken ranges running parallel to the plate boundary axis (southwest to northeast). In much of the central area there are thick sheets of ignimbrite (very thick, often welded deposits formed from clouds of semi-molten material, which are generally closer to the source than the airfall tephras), some of which are from the Taupo eruption. These end in, or erode to form, characteristic steep-walled gully forms, leaving overhangs and caves.

Along the coast, post-glacial sea rise has led to the formation of a barrier islands (Matakana) and spits, some of which are anchored to outcropping harder rock islands (Bowentown, Mount Maunganui, Maketu, Ohiwa). Behind these, embayments have formed harbours and estuaries in some places, whilst being filled with sediment in other areas where the sediment load has been higher (from the Rangitaiki River in particular)—some of these infilled areas are low-lying and swampy, as on the Rangitaiki Plain (Pullar 1985) and along the coast from Papamoa to past Maketu.

5 . 2 VOLCANIC AND TECTONIC ACTIVITY

Geologically, this is a very active region, with many young geological features. The greater part of the structure of the Taupo Volcanic Zone is believed to be quaternary in age (i.e. formed within the last 1.8 million years). Holocene events in the area (i.e. occurred within the last 10 000 years) are described below.

5.2.1 Mayor Island (Tuhua)

The most recent eruption in the Mayor Island calderas is dated at 4400 years BP (before present) (Houghton et. al. 1992). Extrusion of the dome in the calderas has continued since then and there is speculation that it was continuing as recently as 500 years BP. Mayor Island obsidian was exploited from the beginning of the occupation of New Zealand; therefore, if the island volcano was still active at this time, it did not inhibit human use of its resources.

5.2.2 Taupo eruptions

The second century AD Taupo eruption (probably AD 181; Wilson et al. 1980) blanketed much of the North Island with pumiceous tephra and some smaller areas with ignimbrite. The deposits of ignimbrite and tephra become deeper the closer they are to the Lake Taupo vent. When the lake refilled the caldera after this last eruption, it is believed a debris dam at the outlet burst, depositing alluvial debris down the length of the Waikato River valley, including along the margins of the Bay of Plenty region in the Broadlands

area. This eruption formed significant elements of the coastal and inland topography, and left soils that introduced particular challenges for both Maori and modern farmers.

5.2.3 Loisels pumice

A dark, hard pumice known as Loisels pumice is present in some coastal areas where it arrived by sea rafting. It has been proposed that this occurred within the human period of occupation. This is discussed further below (sections 5.4 and 7).

5.2.4 Kaharoa eruption

One particular eruption occurred close to the main period of settlement of New Zealand by Maori. This is the Kaharoa eruption, and it has become an important marker in studies of the prehistory of New Zealand (Lowe et al. 2000, 2002). The eruption, which was on the Okataina eruptive centre—the same volcanic centre as Mt Tarawera—is believed to have proceeded over several years; Nairn et al. (2001) estimated 4 years, with a range of 4–20 years. The initial stage was a short-duration eruption that deposited rhyolitic ash over all of the coastal part of the Bay of Plenty region and beyond; ash depth is 30 cm on the coast closest to Mt Tarawera, and thins to 4 cm at Waihi on the western boundary of the study area. The ash eruption was followed by rhyolitic dome building, including the creation of much of the present Mt Tarawera. The Kaharoa ash has been very precisely dated to AD 1305 ± 12 (95% confidence limits; Hogg et al. 2003; see also Higham et al. 2000, 2001; Buck et al. 2003); this is the most precisely dated event in New Zealand prehistory. Consequently, this ash forms a stratigraphic marker of known age that can be used to help date settlement in this part of New Zealand.

Following the eruption, the outlet of Lake Tarawera was dammed by erupted material washed in from a side catchment at the lake outlet (Hodgson & Nairn 2000). The lake rose by an estimated 30 m, but did not stay at any level for very long, indicated by the fact that no lake terraces have been left. It has been estimated that there was 5 years between the dam forming and it bursting. The dome building at Tarawera had not finished when the dam burst, as there is tephra from a late minor eruption over the outwash deposits close to the mountain. The resulting flood peak was substantial, estimated at between 10 000 and 100 000 m³/s. This flood wave carried much material with it and had a dramatic effect on the Tarawera River valley and the Rangitaiki Plains where the flood emptied, building a new fan.

The volcanic infilling of the Okataina eruptive centre and the frequent re-disturbance of deposited material by later eruptions has left a basin that does not have normal drainage. Many of the smaller and some of the larger lakes, including Lakes Rotoma, Okataina, Rotomahana, Okareka and Rotoehu, have no surface overflow. With underground drainage, their levels are subject to variation according to cycles of wet and dry years, the arrival of sediment (which can restrict the existing flows), and other events that can re-open the water drainage. This variation in water level has resulted in some submerged prehistoric sites on lake margins.

5.2.5 Tarawera eruption

The Tarawera eruption of June 1886 had major effects in its vicinity. The eruption on the mountain crest opened a rift that erupted basaltic lapilli and finer ash—unusual for this volcanic centre. The lapilli blanketed a considerable area around the mountain. Smaller lava eruptions continued through to October 1886. To the southwest, the eruption was mainly phreatic, with water under pressure flashing to steam. These phreatic eruptions ejected mud and fresh and hydrothermally altered rhyolitic rock, as well as some fresh basalt. Eruptions here continued into July 1886.

The Rotomahana crater was empty of water for 7 years after the eruption (Warbrick 1934: 111), but then progressively filled to reach a level 40 m above the adjacent Lake Tarawera, with a depth of up to 280 m.

The known death toll in the eruption was 108 named individuals, but it is believed that more people than this were killed. Many died at Waihi Village, the site of which is now an archaeological tourist attraction. Other archaeological sites were buried by the tephra. Those closest to the eruption source cannot readily be accessed by normal archaeological techniques (Ritchie 1991). At older sites more distant from the eruption, storage *pits* have been infilled and are difficult to see from surface indications, even if terracing and defensive features can still be seen. After the 1886 eruption, the outlet of Tarawera Lake was again blocked by debris, from the same side catchment as the post-Kaharoa dam (Hodgson & Nairn 2000, 2005). This dam may not have formed until some time after the eruption. It raised the lake by about 13 m, during which time an archaeological site on the lake shore (U16/11) was buried (Gregg 1956). The dam burst 18 years after the eruption (in 1904), following heavy rain, and the lake level dropped by approximately 2–3 m over several days; however, it did not regain the pre-eruption level. There was extensive flooding down the Tarawera River, with fan building on the Rangitaiki Plains. Historical records indicate that sediment infilling of the Tarawera River channel associated with this event left the area flooded for a considerable period, until the river channel re-established itself (Pullar 1985). The fan building was exacerbated by a chance erosion event in a tributary of the Tarawera River. The fan seems to be related to the apparent lack of archaeological sites on the river flats around Kawerau, in contrast to the quite high density of sites on the surrounding hills.

The level of Lake Okataina began to rise after the 1886 eruption (most likely as a result of Tarawera ash restricting the underground drainage), causing the Maori population to leave the area. The lake level reached a peak in 1930, but quickly dropped again by 4 m after the 1931 Napier Earthquake, which must have re-opened some drainage pathways. The lake remains at least 10 m above its pre-Tarawera eruption level and has submerged Maori archaeological sites on its shores (Johnson et al. 1967; Grace 1982; Lawlor 1983b). The carbon date of a palisade post from a site now deep in the lake (NZ1129) confirms that the older low level was not short lived. Grant (1996: 105) cited this and variations of lake levels in the district as evidence of changes in rainfall, but the linkage to ash falls and earthquakes at Okataina cautions against this as a sole explanation. The level of Lake Rotorua also rose after the Tarawera

eruption, probably in response to sediment in the Ohau Channel. It then fell back to its modern level.

Lake Rotoma also has a flooded Maori archaeological site on its shore as a result of changes to the underground drainage since the earlier occupation of the site (Moore 1963). Stafford (1999: 23–30) recounted the traditional story of an earlier disappearance of an island in the lake.

An aftermath of the Tarawera eruption was ongoing activity at the Waimangu Valley at the extreme southern end of the rift. The Waimangu (black water) geyser reached heights of 1600 feet. It had sustained activity from 1900 to 1904 and 1917 to 1918, with other briefer outbursts in 1906 and 1915. Visitors to the site were killed by eruptions in 1903 (four deaths) and 1917 (two deaths). During the latter event, a tourist accommodation house 600 m away from the geyser was also destroyed.

Ash from the 1886 Tarawera eruption affected agriculture. At Te Puke and Tauranga, stock had to be moved away until the pasture recovered (Stewart 1908: 98; Taylor 1969: 85). However, the ash deposited at more remote Athenree acted as a fertiliser, encouraging new planting (Stewart 1908: 99).

5.2.6 White Island

White Island is a continuously active volcano. It is one of a series of volcanoes (most of them under water) that extend northeast from the Bay of Plenty.

5.2.7 Land instability associated with geothermal areas and tectonic activity

Land in geothermal areas is frequently unstable. Land subsidence in response to changes in activity is a common occurrence. The flooding of part of a *pa* alongside Lake Rotorua near Ohinemutu (Tapsell 1972: 55) is most plausibly linked to such a movement. Stafford (1994: 15) noted a site a little further to the north, also on the lake edge, which has apparently also been submerged by the lake.

At Ohaaki, steam extraction for geothermal power generation is causing subsidence, which is flooding occupation sites along the edge of the adjacent Waikato River.

Although the Rangitaiki Plains are believed to be an area of recent subsidence and swarms of small earthquakes are common, the area is not believed to be as susceptible to very large earthquakes as other parts of New Zealand. The only substantial earthquake recorded in recent times is the 1987 Edgecumbe earthquake. Registering 6.3 on the Richter Scale, this was linked to vertical fault displacements of up to 2 m. The plate boundary is the site of more frequent earthquakes offshore from the Bay of Plenty coast.

Large earthquake and volcanic events beyond the Bay of Plenty are likely to have impacted on this region. As mentioned previously, the onshore Taupo Volcanic Zone extends northwest into the Pacific Ocean to the Kermadec Islands and beyond. Many submarine volcanoes are now known to exist along this route. The tsunami hazard these currently present to the Bay of Plenty (Latter et al. 1992) must also have existed in the past. Eruptions are not

the only hazard these undersea mountains present. The submarine Macauley Caldera, which is northwest of Macauley Island in the Kermadecs, erupted 6000 years ago. Since the eruption, the northern and southwestern flanks of the caldera have collapsed outwards, and the part of Macauley Island flanking the caldera has also collapsed into it (Lloyd et al. 1996). The date of the collapse or collapses is not known, nor is it known if they caused tsunami that affected the Bay of Plenty. However, tsunami are always a possibility with these events and they present a continuing risk to the Bay of Plenty coast (Wright et al. 2002: 8). The Healy caldera, which is situated a little less than half way to the Kermadecs from the Bay of Plenty, has erupted in the last 2000 years producing pumice. This is considered a possible source of the Loisels pumice (Wright et al. 2003) and potentially of tsunami during eruptions or subsequent caldera collapse (Walters & Goff 2003: 147).

Studies of sediments behind beaches have identified what are interpreted as tsunami deposits from within the potential time of Maori occupation at Waihi Beach and Ohiwa Harbour (Anon. n.d.b). Earlier events have also been recognised. It is believed events need to have greater than a 5 m run-up (maximum vertical height onshore) to have left a geological trace. Tsunami deposits at Ohiwa are thought to have originated from about the time of the Kaharoa eruption. This is considered a local tsunami event. Later deposits at Ohiwa and Waihi Beach are considered to have originated from a regional event, linked to Loisels pumice and the Healy caldera collapse. This tsunami event is dated by them to AD 1302–1435 (Bell et al. 2004: 36).

Modelling of tsunami waves from different earthquake sources has demonstrated that run-ups of 3 m are feasible in the Bay of Plenty from South American sources and from the Tonga/Kermadec trench (Goff et al. 2006). Goff et al. (2006) did note, however, that the size of Northland and Coromandel tsunami can only be explained by local sources. Such local source waves may have been much attenuated by the time they reached the Bay. If tsunami occurred, they could have affected people residing on the coast and removed archaeological evidence of earlier occupation.

5.3 EROSION AND DEPOSITION PERIODS

Some major periods of erosion have been defined for alluvial deposits from the Whakatane River eastwards (Pullar 1962; Pullar, Pain et al. 1967; Grant 1985). During erosion events, large amounts of material are removed from the hills and deposited in lowland areas. Pullar's original classification was modified by Grant (1985), who defined three precise erosion/deposition periods: the Waihirere alluvium of 680–600 years BP, the Matawhero alluvium of 450–330 years BP, and the Whakarara alluvium of 180–150 years BP. These were dated by C14 dating and tree rings. Grant believed that these erosion/deposition events were linked to climatic cycles.

In the lower Whakatane Valley, a sedimentary history has been defined that extends into the human period (Pullar, Pain et al. 1967). Here, a post-Kaharoa eruption infill surface is recognised, which is estimated to have been formed about AD 1450; the river subsequently cut down through it. This surface

would align with Grant's (1985) Matawhero alluvium. Lessening of sediment supply has been given as a reason for the end of sedimentation, but this is not the only explanation; the Whakatane River also shortened its route to the coast substantially during this time, which would allow upstream lowering of the bed. The depositional surfaces have useful soils and these are of significance to Maori and to later use.

5.4 COASTAL STABILITY AND PROCESSES

Coastal exposures of sediments can be useful for examining sedimentation history. An early study by Wellman (1962) looked at coastal sections in various areas of New Zealand, including some from the Bay of Plenty. He recognised the Kaharoa Ash in these sections (Wellman 1962: 50–54), as well as an earlier pumice layer, now called the Loisels pumice. Based on carbon-dating of charcoal recovered from beneath it both here and elsewhere, this pumice was thought to just post-date human settlement. A date of AD 1350 has been derived from C14 dating, but this would place it later than the Kaharoa ash, which seems strange given that elsewhere it occurs beneath it. However, the pumice in the Loisels deposits has proven to be mineralogically diverse and is now thought to have been deposited from differing sources on varying dates, which may account for the disagreement between stratigraphy and dating. Furthermore, some of the dating problem may arise from pumice being redeposited in contexts of more recent age, as it is light and readily moved around by water.

McFadgen (1985a: 49–50) re-interpreted Wellman's (1962) sections for the Bay of Plenty in terms of erosion events. He inferred alternating phases of stable periods when soils formed and periods when these newly formed soils were buried by new sediment. The period AD 1350–1500 was a stable period when the 'Tamatean' soil formed. Another stable period occurred

TABLE 2. COMPARISON OF GRANT'S (1985) AND MCFADGEN'S (1985a) DATES FOR ALTERNATING PHASES OF EROSION/DEPOSITION AND SOIL FORMATION.

GRANT (EROSION/ DEPOSITION)	MCFADGEN (STABLE: SOIL FORMATION)
Post 1770, Whakarara	1550–1800, Oahuan
1500–1650, Matawhero	1350–1500, Tamatean
1270–1350, Waihirere	

from AD 1550 to 1800, when the 'Ohuan' soil formed. Grant's (1985) and McFadgen's (1985a) sequences generally align (Table 2).

The Bay of Plenty shoreline is particularly changeable, and this has affected the availability of places for settlement. This is highlighted by examining the changes that have occurred at a range of geomorphological features along the Bay of Plenty coast, from west to east.

The tombolo from Waihi Beach along to the Bowentown head would have formed well before

human occupation. There are minor instabilities along this length of coast (Healy 1978).

Matakana Island is New Zealand's only sand island. It formed on an earlier consolidated Pleistocene sand deposit, now on the harbour side of the island. Holocene development commenced with formation of a wash-over bar extending out from the older parts, which then progressed to coastal spits, extending along both the north and south entrances to Tauranga Harbour (Tauranga Moana) (Shepherd et al. 1997). Wetlands developed on the harbour side of the bar and the coast grew towards the sea on the ocean side, continuing past the Taupo eruption shoreline, which is now typically 200 m inland from the present ocean beach. The new land on the ocean side became forest-covered. As recently as 600 years BP, however, the harbour openings appear to have been much wider than they are now, with the southern opening apparently 3 km wider than at present. Since Kaharoa eruption times, the northern opening has closed by 3 km. It would appear, at least at the southern entrance, that an erosion event occurred before this closure, as a marked shoreline is present that dates back to 600 years BP (the Purakau shoreline; Shepherd et al. 1997: 61–63, 67). The southern entrance quickly narrowed again and the northern more slowly. The cause of these events is not completely clear, though McFadgen (2007: 174) attributed the erosion event linked to the Purakau shoreline to a tsunami. These erosion events define some areas of land where early sites will not be found and later settlement will be limited by the absence of developed soils.

Schofield (1964, 1968) studied a sedimentary exposure in a coastal rock shelter at Ongare Point that had been occupied by Maori. He sought to link its period of occupation to a recent period of low sea level, but accepted that the shelter may have become habitable as a result of land uplift rather than sea level change.

The tombolo attaching Mount Maunganui to the mainland would have established before humans arrived in New Zealand. As a result of recent development along the Papamoa coastline, its stability has become the subject of considerable recent planning interest. It would appear that this part of the coast has had limited progradation and has been relatively stable over the period of human occupation.

The Kaituna River currently drains through protection works well to the west of the Maketu Estuary, but in the earliest historic record it drained through the estuary. The spit was low and narrow and there is an early record of a ship washing over it in a storm. The estuary was heavily silted by a flood in the 1890s (Stokes 1980: 300) and a new western outlet broke through the dunes in 1907 during a large flood. The mouth then migrated eastward back to the estuary until it was stabilised by engineering works in 1955. The river was also recorded as breaking through the spit in 1840 (Matheson 1999: 79), so it seems that there may be recurring cycles of the river breaking through at the west and then migrating back to the Maketu entrance. The Maketu Estuary formed a second entrance in 1978, which later closed.

The coastline of the Rangitaiki Plain has steadily prograded (moved seaward) since the time of the Taupo eruption (Pullar 1985). Earlier shorelines can be traced only on the eastern part of the plain; it would appear that geological subsidence (the Whakatane Graben is the structure that is sinking) may have resulted in these being covered in the west. The Whakatane River has maintained its present mouth but its course has changed markedly near Whakatane within human history (Pullar 1963; Pullar et al. 1978).

The other rivers of the plains—the Tarawera and Rangitaiki—did not formerly drain through their present outlets. Before 1886, the three rivers (Whakatane, Rangitaiki and Tarawera) had only two outlets. Linked distributary streams carried the water from the Tarawera and Rangitaiki Rivers to outlets at Whakatane and Matata, east and west of their current engineered outlets. The now closed Matata outlet must have been an important waterway. This drainage probably formed after the catastrophic infilling of the plain following the Kaharoa eruption and the Tarawera lake burst that followed (section 5.2.4; Pullar 1985: 23). The Tarawera River was permanently diverted to its present outlet in 1924 and the Rangitaiki in 1914. The presence of diatomaceous deposits over the western part of the plains indicates that lakes must have existed beside the rivers for a substantial period from the Kaharoa eruption onwards. At Kohika, the local area of lake infilled at the end of the occupation of the site in the early 18th century.

The Ohiwa Harbour has been particularly unstable in recent history. There is evidence here of land subsidence after the time of the Kaharoa eruption (Pullar et al. 1977). One study suggests that the spit closing the harbour formed in the last 2000 years (Richmond et al. 1984); it appears to have only commenced forming once sediment sources to the west had completed the infill of the Whakatane graben. In historic times, the entrance has retreated eastwards and then regrown. The most recent retreat, which was occurring from the earliest written records and ceased in the 1970s, removed the former town and wharf of Ohiwa, which was established in the 19th century. The recent additions and removals of land at the harbour entrance limit the survival of early archaeological sites, which may have been removed by erosion. Some new areas are unlikely to have old sites or site types that might be found only in areas of mature soils.

5.5 STONE RESOURCES

Ignimbrite and pumice are the ubiquitous rocks of the region, although other volcanic rocks are also relatively common. Older sedimentary greywacke rock is present in the east. This subject will be revisited in respect to resources used by Maori.

5 . 6 SOILS

Soils in the Bay of Plenty are predominantly derived from volcanic ash. Some of these are very recent, especially those formed on ash from the Tarawera eruption. Soils derived from Taupo eruption pumice cover a large area in the southern part of the region. The yellow-brown pumice soils have allophane as a clay mineral derivative and are of relatively low fertility because this clay locks up phosphorous. However, although they have some element deficiencies, they respond well to fertilisers (Leamy & Fieldes 1976: 126). These soils are drought prone. Well-drained coastal soils are, more typically, yellow-brown loams formed from older ash (Leamy & Fieldes 1976: 127), with more recent addition of the Kaharoa ash. They are friable and free-draining, store water well and are productive soils, but need fertilising for sustained use.

The earliest pastoral farmers in the central North Island found that the pumice-derived soils could not sustain animal growth (for the affected area see McKinnon 1997: plate 92a). The phenomenon was known as bush sickness, and its cause was unknown until the 1930s, when it was discovered that the pumice lacked cobalt. As a consequence, in early times much of the land in the region was seen as only good for forestry. Although this is not a necessary restriction now, as the deficiency can be corrected with application of fertilisers, exotic forest use is now established as a dominant use in these areas (although pastoral farming is now replacing exotic forestry).

The formerly extensive swamps of the lowlands near the coast have been drained, particularly on the Rangitaiki Plain. These now form fertile areas that are very suitable for horticulture and dairy farming, and of considerable economic significance to the region and New Zealand as a whole.

5 . 7 VEGETATION

The forests of the central North Island were devastated by the AD 181 Taupo eruption. After the eruption, uplands in the Bay of Plenty region recovered to have conifer/broadleaf-dominated forest, while to the east the higher ranges had beech (*Nothofagus* spp.) forest. The northern end of the region is within the modern growth range of kauri (*Agathis australis*), but the stands found in the 19th century were not extensive. Kauri gum digging around Tauranga Harbour has shown that the extent of kauri was formerly greater there. McGlone & Jones (2004: 37) identified high levels of kauri pollen in pre-Kaharoa sediments at Kohika and suggested that kauri grew in the Tarawera River catchment at that time. On the west of the Kaimai Range, the Waihou River levees would have had kahikatea forest throughout human prehistory, backed by lower swamp vegetation in the wetlands. This type of cover may have prevailed in low-lying areas in the Bay of Plenty, unless disrupted by ash fall.

Mount Tarawera, the highest point in the region, had vegetation that was stratified according to elevation. Pohutukawa (*Metrosideros excelsa*) forest on the shore of Lake Tarawera was succeeded by tall forest, kanuka (*Kunzia ericoides*) scrub and sparse scrub at higher elevations. The 1886

eruption disrupted this pattern, and kamahi (*Weinmannia racemosa*) and tawa (*Beilschmiedia tawa*) became pioneer tree species in the devastated area (Clarkson & Clarkson 1991). Pollen diagrams from coastal wetlands indicate there was stability in the coastal vegetation prior to the Kaharoa eruption. The wetlands had some dry areas where tephra-blanketed old beach ridges rose above the lower-lying areas. Forest was present on these, with sedge, raupo (*Typha orientalis*) and wetland shrubs on areas of lower-lying, but not submerged, land. At Kohika, on the Rangitaiki River, there is evidence that the Kaharoa tephra damaged the dryland vegetation and changed the wetland environment (McGlone & Jones 2004). Pollen studies from this site indicate that there had been fires in the damaged forest. This study showed that there was a time gap between the Kaharoa Ash and full-scale deforestation at Kohika. Other sites studied showed a rise in bracken fern (*Pteridium esculentum*) spores—indicative of fire disturbance—starting at about the time of the Kaharoa ash fall and increasing unabated thereafter (Newnham et al. 1998; Lowe et al. 2002: 136). Typically, charcoal fragments in the pollen core samples rise with the bracken spore count.

In many parts of the Bay of Plenty region, the pattern of disturbance, once established, did not reverse—the scrub did not proceed to forest. This indicates continued human intervention (generally by fire). In other places, where there was not continued refiring, the forest was able to recover. McElvey (1958) illustrated areas in the Urewera Range that have scrub forest recovering from human-induced fires. On drought-prone pumice soils, the presence and use of fire in human settlements and land use areas, and the inflammable nature of the seral bracken and manuka (*Leptospermum scoparium*) scrub, meant that cleared areas stayed cleared and increased in area with repeated fires. McGlone & Jones (2004) noted the frequent presence of kamahi and rewarewa (*Knightia excelsa*) pollen after the Kaharoa ash fall, suggesting regenerating forest patches (these species are prominent in regenerating forest). Kevin Jones (DOC, unpubl. data) noted areas south of the Whirinaki basin that had seral stages of forest recovery, suggesting clearance that was initiated up to 200 years ago.

Where there was intense Maori population pressure, such as around Tauranga Harbour, the forest had gone by the time the first Europeans arrived, and the bushline was already remote from the coast. This delayed the onset of colonial indigenous timber felling in the Bay of Plenty area until other more readily available timber elsewhere had been used. At Ruahihi Pa (U14/38), ash deposits from a fire outside the site have been found across the whole site (McFadgen & Sheppard 1984). This fire has been dated to the mid-18th century, and the amount of ash deposited indicates that Maori forest clearance fires could be very intense.

There is evidence of early human disturbance of the forests around Rotorua (Nicholls 1991: 12). Further inland, extensive scrub-covered areas gave the pumice areas a reputation for infertility with early colonists, particularly at Kaingaroa, where there were frost flats with very little vegetation. Later farmers proved this perception wrong. A classic account of bringing land considered to be of low value into production is provided by Vaile (1939).

5.8 TERRESTRIAL FAUNA

The forested areas of the Bay of Plenty region are likely to have had a full range of the forest birds of New Zealand. The species now finding refuge in the Urewera National Park illustrate the range that would have been present at the time Europeans arrived. These include birds that are now rare in remaining forests, such as kokako (*Callaeas cinerea*), kiwi (*Apteryx* spp.), red- and yellow-crowned parakeets (*Cyanoramphus* spp.), kaka (*Nestor meridionalis*), New Zealand pigeon (*Hemiphaga novaeseelandiae*), New Zealand falcon (*Falco novaeseelandiae*), blue duck (*Hymenolaimus malacorhynchos*), whitehead (*Mohoua albicilla*) and weka (*Gallirallus australis*), as well as other less threatened native forest birds such as morepork (*Ninox novaeseelandiae*), tui (*Prosthemadera novaeseelandiae*), bellbird (*Anthornis melanura*), fantail (*Rhipidura fuliginosa*), grey warbler (*Gerygone igata*), tomtit (*Petroica macrocephala*) and North Island robin (*Petroica australis*).

It is clear that moa returned to the area devastated by the Taupo eruption. Moa remains have been found in areas associated with humans at Taupo (Leahy 1976: 51) and at Tokoroa. At both sites, the species has been identified as a small ‘bush’ moa, *Euryapteryx curtis* (Law 1973; Worthy & Holdaway 2002: 196). Worthy & Holdaway (2002: 196) noted that there are few fossil sites in the Taupo eruption tephra area, but that some sites on the periphery of the area suggest that *E. curtis* was common once vegetation had re-established. Other moa were also present: an example of *Dinornis giganteus* was found at Turangi—not in human association but clearly post-Taupo eruption (Worthy 2001); and a dated bone in the radiocarbon database, reported as coming from silt (2 m deep) in the Kawarau Valley (*sic*—presumably Kawerau), is firmly within the post-Taupo eruption period and has been identified as *Pachynornis elephantopus*.

Water birds are currently well represented in the Bay of Plenty area, and must also have been common in the past. Habitat for wetland birds such as fernbirds and bitterns was severely reduced in the 20th century, when coastal wetlands were converted to pasture; therefore, their numbers now must be far fewer than in the past.

Petrels (Procellariidae) are common on Bay of Plenty offshore islands, and gannets (*Morus serrator*) nest on White Island. These birds were important resources for Maori and this use has continued until modern times. The name Motiti (for one of the significant islands off the Bay of Plenty coast) might record the presence of petrels (titi), but the origin of the name is confused. One account suggested the name is a relatively recent contraction of Motuiti (small island) (Matheson 1979: vii). However, renderings with vowel lengths indicated—Mōtīti (Matheson 1979: 21) and Mōtīti (Ballara 2003: 251)—suggest that this derivation from Motuiti is less than likely, as such a name contraction is unusual and would have involved two, if not three, vowel length shifts. Names including titi also occur on the mainland, possibly recording onshore nesting sites of petrels. Nesting of petrels on the mainland, although rare, still occurs at a few sites elsewhere in New Zealand; it no longer occurs in the Bay of Plenty area, however.

The arrival of Polynesian rats (*Rattus exulans*, Pacific rat) had a devastating effect on many of New Zealand's native birds, aided in some cases by direct human predation. Ultimately, it was the destruction of forest and wetland environments from the 19th century onwards that had the most pervasive effect on the abundance of bird species.

5.9 MARINE FAUNA

The Bay of Plenty has a diversity of marine environments. Pelagic (open sea) fish visit the bay and the offshore islands, and reefs provide habitats for more sedentary fish species. Sandy shores provide habitat for shellfish and the species that eat them. Tauranga Harbour is a sizeable sheltered tidal waterway for other fish species. Modern fisheries in the Bay of Plenty area include flatfish from Tauranga and Ohiwa harbours, and shark, kahawai (*Arripis trutta*), snapper (*Pagrus auratus*), skipjack tuna (*Katsuwonus pelamis*), jack mackerel (*Trachurus novaezelandiae*) and blue mackerel (*Scomber australasicus*).

The Bay of Plenty sandy shores have abundant surf-beach species, except along the Pukehina to Matata section of the coast where wave energy is high and the beaches steep. Mainland rocky-shore shellfish environments are abundant on the offshore islands.

Before people arrived, fur seals (*Arctocephalus forsteri*) were much more common in the northern North Island, although seals may never have been common in sandy areas of the Bay of Plenty coastline, as predominantly sandy shores are not attractive to seals as haul-out areas.

5.10 FRESHWATER FAUNA

Freshwater animals were abundant in the Bay of Plenty when the first humans arrived. Some are still relatively abundant, including eels (tuna, *Anguilla* spp.), freshwater crayfish (koura, *Paranephrops zealandicus*) and freshwater mussels (kakahi, *Hyridella* spp.). These are recorded in Maori place names such as Kaituna and Rotokakahi, and are still sought by modern-day Maori and others. Buck's (1921) early 20th century study of fishing at Rotorua recorded the use of other fish as well. Inanga (whitebait, *Galaxias maculatus*) were once a substantial resource of the Rotorua Lakes. After Europeans arrived, the release of trout (brown trout *Salmo trutta*, and rainbow trout *Oncorhynchus mykiss*), bullies (*Gobiomorphus* spp.) and carp (Cyprinidae) is believed to have considerably reduced the abundance of native species, largely through competition. In the case of the freshwater mussel, its abundance was reduced because transport of the larval stage, which is attached to fish, occurs less readily with introduced species of fish than with native species.

6. Anthropology in the Bay of Plenty

6.1 ETHNOGRAPHY

While there has been much recording of Maori traditional history for the Bay of Plenty region, relatively little of the historic fieldwork in the area resulted in straightforward accounts of the then current cultural practices, such as fishing, though there are some exceptions. Elsdon Best, in his many publications, must have often drawn on his Urewera fieldwork (the Urewera Ranges form the eastern boundary of the Bay of Plenty area), but this is rarely explicit. His normal mode of placing little emphasis on any regional differentiation in Maori culture does not help to distinguish local components. Best's Dominion Museum Monograph publications 'Some aspects of Maori myth and religion' (Best 1922a) and 'Spiritual and mental concepts of the Maori' (Best 1922b) seem to contain fewer citations of other people's work than some of his other publications. Thus, they may well report mainly material he collected. However, a Urewera source cannot be assumed for this information, as he recorded information on Maori practices while resident in other parts of New Zealand as well. Whilst in the Urewera area, Best must have observed bird hunting. It is tempting to suggest that accounts of birding (particularly the hunting of native pigeons) in 'Forest lore of the Maori' (Best 1942), which is un-attributed to other sources, may be based on Urewera observations. Best's Urewera hut is a recorded archaeological site (W16/294).

In 'Primitive economics of the New Zealand Maori', Firth (1929) illustrated his text with a map and photographs of a contemporary Maori village—Ohaua te Rangi—on the Whakatane River. However, it is not clear whether the observations he made there contributed to his publication. It is evident that in quite recent times opportunities for ethnographic recording were lost. This is best illustrated by Buck's (1921) detailed account of fishing at Rotorua, which drew on fieldwork he did there before World War I. This detailed account of an aspect of contemporary culture raises the issue of what else a diligent ethnographer might have been able to record at that time. Another very valuable source of ethnographic observation is Maggie Papakura's 'The old time Maori' (Papakura 1938), which includes a wealth of detail about the lifestyle of Maori in the Rotorua area, particularly during her childhood and up until her departure from New Zealand in 1911. A recent biography gives some background as to the likely places of the experiences she reported (Diamond 2007).

It is sad to look at an account such as Ettie Rout's 'Maori symbolism' (Rout 1926), which was drawn from a Te Arawa informant (Hohepa Te Reke—see Stafford 1999: 107–8), as the material it contains is, to us now, clearly acculturated, and other better informants clearly existed. Examples of more rounded accounts drawn from the historical record have recently emerged. Tapsell's 'Pukaki, a comet returns' (Tapsell 2000) very nicely places

an outstanding taonga—an iconic carving from a Rotorua pa gateway—into its modern and historic cultural context, while Neich's 'Carved Histories' (Neich 2001) reveals the history of the carvings of Ngati Tarawhai of Lake Okataina and much about the carvers and their world in the process. Neich (2002) has studied the gateways of Maketu Pa (V15/158), which were photographed and drawn in the 19th century but have not survived to the present day.

There is clearly an opportunity for archaeology to fill in missing detail. A starting place is studies of objects in museums. With the exception of Neich (2002), these are, as yet, rare. An additional example is a study of the adzes in the Whakatane Museum (Moore 1977), as are studies of Katikati wooden artefact finds at U13/867 (Simmons 1971a, b). Tapsell's (2006) review of the Gilbert Mair collection in Auckland Museum, much of which came from the Bay of Plenty region, shows the rich stories that can be associated with museum collections. There is scope for many more. Archaeology will always be limited in the aspects of society it can reveal, but in terms of the Bay of Plenty, that limit is far from having been reached.

6.2 TRADITIONAL HISTORY AND ARCHAEOLOGY

The Bay of Plenty is well served by published accounts of traditional Maori history. Some of the earliest published accounts, such as the pioneering 'Polynesian mythology' (Grey 1855) and accounts by Shortland (1856, 1882) and Wilson (1906), recount traditions from the Bay of Plenty area. More comprehensive accounts are present in the *Journal of the Polynesian Society*, such as Best (1928) on Whakatane. Best's 'Tuhoe, the children of the mist' (Best 1925), which covers an area straddling the eastern border of the region, is the pioneer in stand-alone publications of traditional Maori history. Following Best (1925), outstanding further contributions include Stafford's (1967) 'Te Arawa', Lyall's (1979) 'Whakatohea of Opotiki', Walker's (2007) 'Opotiki-Mai-Tawhiti', and Grace's (1959) 'Tuwharetoa', the last of which is predominantly about the Taupo region but commences with the Bay of Plenty origins of that iwi. More recently, Steedman's (n.d.) 'Te Toto' recounts Tauranga traditional history and attempts to reconcile conflicting accounts. 'Te Waimana: the spring of Mana' (Sissons 1991) deals with Tuhoe during the period of colonial conflict, but draws on later traditional history and is also a critique of Best's work.

Matheson (1979) drew together Motiti history, as did Tapsell (1940) for Maketu. Both extended their accounts into modern history. Ballara (2003) used the history of conflict at Maketu as one of her study areas in seeking the causes of the early 19th century Maori conflict.

It is not the function of this review to attempt to summarise traditional history. Nevertheless, archaeology and traditional history use different tools and perspectives to deal with the same Maori story, and there must be a common ground between the two approaches. A recent development in publications has been to relate traditional history much more closely to sites and geographical features. In traditional settings, such linkages would,

of course, never have been lost, but the earlier published accounts gave it little recognition. Thus Stafford's two volume 'Landmarks of Te Arawa' (Stafford 1994, 1996) provides a wealth of detail about the localities associated with traditional and more modern Maori history in the Rotorua area. Phillips' two volume 'Landmarks of Tainui' (Phillips 1989, 1995), although focused away from the Bay of Plenty, covers sites in the west and north of the region. However, these reports make only restricted use of archaeological records of the sites identified where they add to or elucidate stories associated with the sites.

At the very least, traditional accounts of sites provide some time benchmarks for when sites were being used. Traditional accounts can never be assumed to provide full accounts of the history of sites, however, as they are very selective of what has been remembered and passed on—generally those events that are socially or politically significant—rather than including accounts of the tools, economy and lifeways of the inhabitants of places. Thus, it is important to realise that traditional history can become very selective and sometimes interwoven with fantastical events. However, it should not be sanitised by removing the latter, as is often done in conventional historical accounts. On the other hand, archaeology can help demonstrate that the manner of land use, economy, tools and lifeways have changed, but cannot identify or confirm which person or social group occupied a site. Therefore, the linkage between archaeology and traditional history is always going to be fraught. Archaeology can, however, provide strong back-up for historical accounts of early settlement. Caroline Phillips' 'Waihou journeys, the archaeology of 400 years of Maori settlement' (Phillips 2000) is a model of integrating archaeological evidence with traditional history.

This shows that there is a major role for archaeology in elaborating Maori history. At present, archaeology is providing most of the information available on the early Maori occupation story. With respect to more recent Maori history, there is still a gap where archaeology could make greater use of traditional history, and traditional history could make better use of archaeology to round out its account. Some Bay of Plenty archaeological fieldworkers, such as Ken Moore and Des Kahotea, have gone some way to integrate the two sources of information, but there is certainly plenty of scope for such integrated studies in the Bay of Plenty.

7. Chronological issues

A number of methods have been used to establish the age of archaeological sites in the region. The airfall tephra layer from the Kaharoa eruption, dated at AD 1305 ± 12 , provides a very precise horizon in the archaeology of the Bay of Plenty. The absence of identified archaeological sites below the extensive coastal spread of this tephra, but their presence soon after, sets the time limit of occupation of the region and, indeed, of New Zealand as a whole. Although some pre-Kaharoa sites have been suggested, they have not survived closer scrutiny (e.g. Pullar 1961a, 1961b: 122). The presence of charcoal in sediments or peat prior to the eruption cannot be taken to prove human presence, since it could result from natural fires. Lapilli from the Tarawera eruption (1886) is often found sealing sites and is a useful marker of the rate of infilling of some features, such as ditches, and a test of whether or not sites have been disturbed.

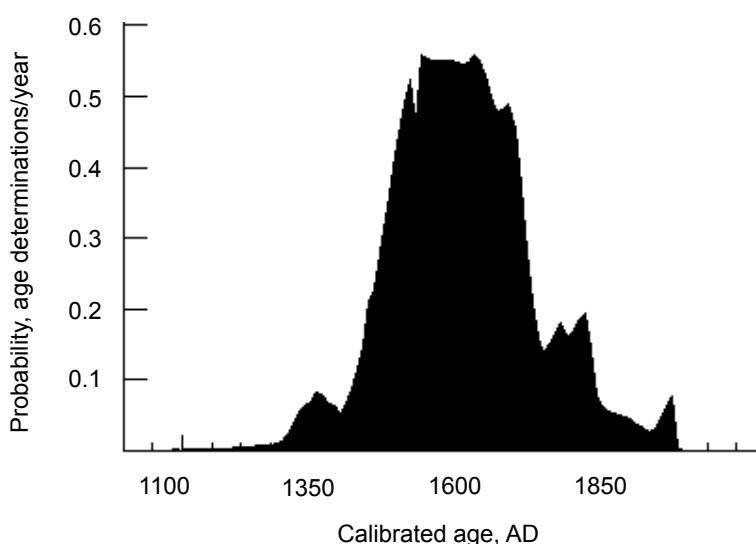
The other known marker present in some coastal areas is the Loisels pumice (first mentioned in section 5.2.3), which is thought to date to around AD 1350, though its age range is somewhat uncertain. This pumice erupted from an undersea source distant from New Zealand and floated to the Bay of Plenty coast, where some of it came to be thrown up onto the land and buried in coastal sediments. It is present in the lowest levels of archaeological sites, such as the midden at the mouth of the Waiotahi River. It has been suggested that it was not derived from a single volcanic event. Pumice dredged from the Healy caldera is a good match in its chemical makeup to some but not all of the Loisels Pumice (Wright et al. 2003: 26). McFadgen (2007) linked the pumice to an eruption of the Healy caldera, but with the provisos that it is not clear how many events of pumice production may have occurred or have been clearly dated (McFadgen 2007: 28, 40), though elsewhere he dated the Loisels pumice to between AD 1305 and 1345 (McFadgen 2007: 222). In addition to primary deposition, erosion and re-deposition of the material may have also occurred, potentially confusing the use of this pumice as a time marker. Utilisation of the Loisels pumice as a time marker in the region has been limited.

Other techniques have been used to assist with dating sites in the period since the Kaharoa eruption. While some dates based on obsidian hydration have been reported from research work covering Matakana and Kauri Point, they have not been discussed in detail or demonstrated a coherent chronological picture. Phillips & Allen (1996a: 268, 1996b: 89) stated that there was good agreement between obsidian hydration and radiocarbon dates for the excavated pa site of Anatere. Radiocarbon dating has provided much of the time control between AD 1300 and the commencement of written records in the 19th century. However, this 500-year span is challenging to differentiate by radiocarbon dating. This is partly because the 95% confidence limits often do not come to less than 100 y, but largely because during the latter part of this time range the ages reported from carbon dating do not translate simply into calendar ages. Natural variations in the abundance of radiocarbon (secular variations) result in a correction curve with wiggles, so that a single date on

a radiocarbon time scale can equate to several calendar ages. Consequently, once the time span of ages has been calibrated to a true time scale, it is even greater than the initial error range.

Figure 2 shows the plot through time of dates in Appendix 3. The time scale is a calibrated one that has been corrected to a true time scale. As can be seen in Fig. 2, there is little evidence for human occupation prior to AD 1300. There is a rapid rise in the frequency of dated sites from the 13th to the 16th centuries, then a plateauing through to AD 1700, followed by a decrease thereafter. In the Bay of Plenty, there are few cases where archaeologists have argued closely timed changes in culture or land use based on radiocarbon dating. We do know that there was some later cultural change, however, as it has been demonstrated stratigraphically at Kauri Point Swamp. The lack of greater use of radiocarbon dating in arguing archaeological sequences must relate either to the limitations of the method applied to this time frame or to archaeologists' use of it.

Figure 2. Frequency plot of calibrated C14 ages from the Bay of Plenty.



8. Resource use

8.1 MAORI RESOURCE USE

8.1.1 Gathered food and plant resources

Forest fruits must have been plentiful for the earliest inhabitants of the Bay of Plenty. Miro (*Prumnopitys ferruginea*) and karaka (*Corynocarpus laevigatus*) berries would have been particularly important resources. Flax nectar and raupo pollen would have been available seasonally from the extensive wetlands. The gradual inland retreat of forest resulting from human pressure in the Tauranga area and elsewhere may have made forest fruits less readily available, but their replacement in the form of bracken fernroot would have been reliable and available throughout the year, albeit less palatable. Clarkson (1991: 94) suggested that the karaka that grow around Lake Rotorua are the result of Maori introductions (one recorded site is U15/619). He also stated that Rengarenga lily (*Arthropodium cirratum*) at Lake Rotoiti was, likewise, the result of planting (its roots were eaten and it was also used medicinally).

There is little archaeological evidence relating to the use of gathered vegetable food. One exception is at Ruahihi, where many plant seeds from consumed fruit have been identified (McFadgen & Sheppard 1984). The presence of fernroot planes (heavily worn surfaces) in the dentition of adult human remains has been used as evidence of the consumption of fernroots in other parts of New Zealand, but little information about this is available for the Bay of Plenty, as there have been few studies of human remains in this area. Starch grains of bracken have been found in an archaeological dog coprolite from the Kohika pa (Horrocks et al. 2004), and fragments of bracken fern occur amongst identified charcoal in remains in a number of middens. Fernroot is prepared by roasting, but would not usually be used for fuel. However, pollen diagrams from adjacent swamps suggest that bracken was abundant in this area; thus, bracken fern may also have been used as fuel. Bracken may also have become established through land clearance fires without necessarily being used for food (Hooker 2001: 17).

The range of materials gathered for uses other than eating is known to have been wide. Boileau (1978) demonstrated that many different woods were used in making wooden artefacts at Kohika. Clarkson (1991: 94) suggested that whau (*Entelea aborescens*) growing on Mokoia Island was probably introduced; whau wood is light and used for net floats. Later in the period of Maori occupation, the inland timber resources of the Bay of Plenty became more important, as there had been substantial clearance of forest along the coast. The Rotorua Lakes area was renowned as a source of canoes (Neich 2001) and Maori from this area traded beyond the region to the Bay of Islands (Stafford 1961: 24). Walls et al. (1990) listed two named varieties of flax collected in the Rotoiti area, pointing to the importance of fibre plants and the maintenance of preferred varieties as cultivars. Archaeological evidence of the use of totara (*Podocarpus totara*) bark exists in the east of the region, with stripped trees recorded at sites V18/14, 15, 46, 32, 34 and 35.

Forest birds such as tui, kaka and pigeon would have been available in areas of undisturbed forest. Shore and water birds must also have been locally readily available, as they had plenty of suitable areas to occupy in parts of the Bay of Plenty. The offshore islands were renowned sites for the collection of immature petrels (muttonbirds) from their burrows and gannets from their nests. White Island, Motunau and Motukahakaha (off Motiti) have all been used for muttonbirding in recent history (Matheson 1979: 31, 33). There is little direct archaeological evidence of the consumption of birds (see Appendix 4), suggesting either that they were minor in relation to other resources or that the archaeological remains may be more concentrated in specialised sites and thus not generally encountered by archaeologists. A remarkable series of discoveries of bird-snaring troughs have been made in no less than six sites (V18/28, 52, 54, 55, 56 and 62) in forest in the Whirinaki Valley, in the inland part of the eastern Bay of Plenty, indicating that pigeon snaring was practised there, and probably elsewhere, during the miro fruiting season. The age of the troughs is unknown, but cannot be great, given that they had survived in aerobic conditions, albeit in a damaged state.

8.1.2 Freshwater and marine resources

Freshwater fish resources seem to have been extensively used and highly valued by Maori, particularly in the Rotorua Lakes area, where freshwater mussel middens have also been recorded. The Kaituna River—consistent with its name—was a renowned eel fishery (Stafford 1962: 4), and an eel channel has been recorded at Minganui (V18/61) (eel channels were built to divert migrating eels into traps). An archaeological example of a freshwater fish trap is also known (U16/44) (Pullar 1975), and a further one has been recorded (U16/ 82).

Extensive marine shellfish middens occur where shellfish are plentiful, particularly on harbours and estuaries. Marine shellfish shells have also been found in occupation sites well away from the coast.

At the time of first contact with Europeans, the Maori population was well-equipped with canoes and they were accomplished offshore sailors. There is no question that their sailing skills were put to use in offshore fishing. Some renowned hapuku fishing locations have been recorded: for example, rocks at Maketu and Wairakei, near Motiti. It can be assumed that large nets were constructed and used as well as bait and lure fishing; likewise, shore fishing, harbour spearing and netting of flatfish will have occurred. The archaeological evidence of different shellfish species in middens is quite extensive but not much studied in overview. As yet, the identification of fish from middens (Appendix 4) is not very comprehensive. Many shellfish middens contain no fish bones, suggesting broad exploitation of the marine environment was not a continuous activity: quite different resources seem to have been used at different times, perhaps in response to seasonal abundances; it is also possible that different groups may have varied in status and thus in their ability to access more prestigious resources.

Marine mammals seem not to have been a sizeable resource in the Bay. There is, as yet, no archaeological or early historical evidence of their exploitation.

8.1.3 Horticulture

The climate and soils of the Bay of Plenty region were suitable for all of the plants introduced by Maori: kumara (sweet potato, *Ipomoea batatas*), taro (*Colocasia esculenta*), gourd (hue, *Lagenaria siceraria*), yam (uwhi, *Dioscorea* spp.), ti (*Cordyline fruticosa*) and paper mulberry (aute, *Broussonetia papyrifera*). In general, however, readily identifiable remains of cultivated plants are rarely present in archaeological deposits. It has therefore been difficult to determine which crops were grown based on archaeological evidence. However, techniques for recognising microfossil remains of plants (e.g. pollen and starch grains) have recently been developed, resulting in the identification of kumara starch in a garden soil on a terrace at U15/9 in Rotorua (Campbell 2005:105; Horrocks et al. 2007). These new techniques offer the prospect of identifying where particular crops have been grown in the past. In the Bay of Plenty area, kumara was extensively grown, but not always recognised in the archaeological record. Gourd is known archaeologically from Kauri Point Swamp. Only one site with living taro has been recorded in the Bay of Plenty—adjacent to a pa site (W15/50) at Ohiwa; this absence contrasts markedly with much more frequent records of living taro from further north in the North Island.

Kumara has a seasonal growth pattern and requires a minimum of five frost-free summer months to mature. This would have been difficult to achieve in more inland areas and sites with warm microclimates that were free from frost damage must have been important. In contrast, potatoes (*Solanum tuberosum*) have less-demanding climatic requirements and were adopted quickly throughout New Zealand after their arrival. In the Bay of Plenty region they appear to have enabled an expansion or enlargement of settlement into cooler inland areas.

Storage pits were used to hold kumara over winter for food and as a source of the new season's plants. These pits, which are believed to have been used only for kumara, are very common archaeological sites throughout the coastal Bay of Plenty area and inland. Their form and history is discussed further in section 9.2.4.

Kumara require good drainage; the plants are quite drought-resistant. Although they are not very demanding of soil fertility, they do benefit from it. The use of ash for soil fertilisation is mentioned by Papakura (1938: 179). Lawlor (see Gumbley 1997: 17) found the addition of wood ash in experimental kumara gardens at Kawerau effective. Soils of Maori origin containing admixtures of sand or gravel are common in New Zealand in the areas where kumara can be grown. They are variously considered to be the result of mulching or of admixtures, with explanations of their purpose including slowing evaporation and assisting the soil in warming (when used as a mulch) or making the soil more friable and/or better draining (when used as an admixture). These soils are variously known as made soils, Maori soils or plaggen soils. The effect of cultivation of soils mulched with gravel is the same as deliberately adding gravels to the soil. Worm action would eventually have a similar effect in moving coarse mulches and additives down through the soil profile. Kumara gardens are frequently described as being formed using planting mounds—commonly called puke. An admixture would be effective in such a garden,

but a mulch would presumably be less so, as it would only be effective in the spaces between the mounds.

The two main ideas on the origin of *admixture soils* are probably not resolvable by archaeological investigation. Admixture soils using sand or gravel are not common in the Bay of Plenty. Jones (1986: 21) identified two sites on the Opouriao river terraces (where gravels may also occur naturally), and Papakura (1938: 179) mentioned adding sand and gravel as a practice. Only four admixture soil sites occur in the records: sites T13/31, T13/747 and U13/59 near Athenree, and site W16/294 on the Whakatane River valley's Opouriao plains. However, since the tephra-derived hill soils of the Bay are naturally friable, sand and gravel addition would rarely have been necessary if friability and drainage was the objective of these additions. Admixture of Kaharoa ash can be achieved in some places by deep cultivation. Such soils, whether produced by this method or as an admixture by borrowing Kaharoa ash from nearby deposits, cannot readily be distinguished from normally cultivated soils that contain this ash as a result of its being close to the surface. Kaharoa ash admixture may have been common in the Bay of Plenty.

Large areas of garden soils have been identified without the need to recognise sand and gravel admixture. Garden soils are recognised by soil A horizons that show signs of cultivation through mottling/inclusion of subsoil clasts and deepening of the soil profile to an abrupt transition to non-cultivated soil below. However, it should be noted that similar profiles can be created by ploughing, so it is important to be able to exclude this origin. Regular plough share furrows in the subsoil are usually distinguishable on excavation; in places that have been ploughed once only, the overturned topsoil or raised subsoil may be recognisable as lumps within the profile.

Substantial areas of Maori garden soils have been recognised by archaeologists on tephra-covered dunes and beach ridges on Matakana Island and at Papamoa (Gumbley 1997). Many other locations have similar evidence of such soils, for example at Athenree, around Tauranga, and on the near-coastal beach ridges of the Rangitaiki Plains (Jones 1991). The spread of evidence of garden soils in the western Bay of Plenty is summarised in figure 4.11 of O'Keeffe (1991).

A pedologist's soil map included in O'Keeffe (1991) shows other substantial areas of garden soil in two elongated areas about 10 km long around Pukehina and Te Puke. Cotching (1998:7) referred to evidence of intensive soil use by Maori at Otamaraku (near Pukehina) and Manoeka (west of Te Puke). The Pukehina soils have been mapped as 'Ohinepanea loamy sand—disturbed phase'; however, causes of the disturbance other than Maori gardening were also suggested. The Manoeka soils were not separately identified in Rijkse & Cotching (1995). Thus, recent soil surveys do not help in confirming whether or not the soils are the result of Maori cultivation. In the case of the area at Te Puke, it is possible that intensive 20th-century urban and horticultural use of the area will have prevented this from being determined in detail—it certainly could no longer be determined today.

Gumbley & McFadgen (1995) interpreted one excavated cross-section as showing cultivation moving progressively from the base to the top of a dune at Papamoa. On a steeper dune, McFadgen & Walton (1996) interpreted a

section as showing the development by successive stages of spreading soil downslope, each with a deep cut into the subsoil. An alternative explanation for the apparently cultivated dune soils at Papamoa has been advanced by Hooker (n.d.), who argued that the dune ridge soils were very drought-prone and less suitable for horticulture than other nearby soils, and thus were unlikely to have been used by Maori. Hooker believed that there has been extensive ploughing of the area, citing some accounts of this and also pointing to the presence of bracken fern root amongst the identified charcoal remains from three middens from the area (Hooker 2001: 17). He suggested that harvesting of bracken fern roots would have had the same effect as cultivation. The seasonal determinations of shellfish from associated middens indicate winter/spring shellfish harvesting, which was the time when fern root was also resorted to for food. Hooker argued that the soil disturbance could have other origins in addition to kumara gardening.

Gumbley (1997) argued that the presence of small storage pits in association with these soils indicates kumara gardening and that 'it seems unnecessarily obtuse to propose that the soil mixing as a result only of gathering bracken root especially when we know that Polynesians were horticulturalists. It can be reasoned that on soils suitable for gardening they would have been used as such'. However, this does not nullify Hooker's explanation. There is a strong case for seeking more direct evidence of plant fossils (using recently developed micro-fossil techniques) to help resolve this interesting difference of interpretation.

8.1.4 Stone resources

Maori used stone for flaked cutting tools, for ground-edge tools like adzes, and for more prosaic uses such as ovenstones and net weights. Pumice was used for a variety of purposes, including small sculptures. Obsidian was a prime resource for cutting tools. Mayor Island (Tuhua) is the major source of obsidian in the region. Obsidian, or volcanic glass, occurs on the margins of acid lava intrusions where the magma has been rapidly cooled before the rock minerals could crystallise. It is more glass-like than crystalline, with conchoidal fractures that form very sharp edges that can be used for cutting. Mayor Island (Tuhua) is unquestionably an early source of this material (Leach & de Souza 1979; Seelenfreund-Hirsch 1985). Later in the history of Maori use of obsidian, Mayor Island (Tuhua) was used less frequently as a source, no doubt as other sources were found. Only three quarries have so far been found on Mayor Island (Tuhua) (Seelenfreund-Hirsch 1985: 157), but the island has not yet been fully surveyed.

Obsidian also occurs in the Rotorua area, but is mostly of less-than-flake quality. One site has been recorded as a quarry (V16/21), but there is no supporting evidence, so the site record must be regarded as suspect. Holroyd (n.d.: 32-35) listed present-day sources of obsidian: Maketu, Rotoiti, Rotokawau, Okataina, Ngongotaha, Hemo Gorge and Tarawera. At some of these, the obsidian is of low quality. The Rotorua sources have been characterised by chemical analysis, but more recent analyses of samples from Maori sites using improved technology have failed to find any obsidian that can be sourced to the Rotorua area.

At Maketu, the obsidian occurs as detritial pebbles of unknown original source. Obsidian from Maketu is known to have been used (Moore 2004). At Waihi, at the very northern limit of the region, there are sources of flake-quality material (Moore & Coster 1989). Although no worked quarry is known of, the source has been recognised in obsidian collections from sites from Paeroa through to Matakana (Moore 2005). None of the obsidian was transported more than 30 km from the source and the date of use, where known, appears to be 17th century onwards. Obsidian is also found immediately to the north of the Bay of Plenty region on the Coromandel Peninsula.

Obsidian is very common in archaeological sites in the Bay of Plenty area, often being observed on the surface of sites during surveys as well as being uncovered during excavations. Although obsidian sources were available in the region, obsidian from Taupo and the Coromandel were also used.

Sources of adze material are known from the region. Orokawa Bay is a source of andesite that has been worked (Moore 2001b), and beach boulders have been quarried at Maketu (Moore 1981). Moore (1981) considered the latter site to be early, but the stylistic evidence for that is not convincing. Moore's (1977) study of the adzes in the Whakatane Museum revealed a variety of source materials. The local sources of some of these have yet to be precisely located. Greywacke from the eastern ranges will probably have no specific source, as it is widespread and common in outcrops and river boulders throughout the east of the region. Spilite associated with greywacke has been used in adzes and is more localised within greywacke outcrops; a quarry source may yet be found. Moore (1977) compared a form of limestone that had been used for two adzes with a modern quarry source at Ruatoki (Kevin Jones, DOC, pers. comm.), and andesite used for adzes to similar rocks at Mt Edgecumbe, Otuhepa and Whale Island.

Ochre was used by Maori for personal and other decoration. Stafford (1999: 114) recorded Rotorua red ochre (*kokowai*) sources as being Puarenga River and scum scooped from a thermal pool at Redwood Grove, Whakarewarewa, which was then boiled until it thickened. Stafford (1996: 125) mentioned a further ochre pit at Waikareao at Rotoma. Motiti has been cited as an ochre source (Matheson 1979: 11). Ballara (2003: 252) noted that people travelled inland from Maketu to collect ochre, but did not say where from.

Red ochre fragments are often found in archaeological contexts. The apparent diversity of ochre sources may make possible studies using chemical analysis of major or trace elements to establish patterns of ochre movement, and the history of use of different sources. Ochre was common in the Kauri Point Swamp site (Shawcross 1977), so some information on the date of use is available, at least from that site.

Papakura (1938: 222) recorded that the flat, rounded stones available from Motiti were favoured for use as fishing net weights. Rounded stones were also preferred for earth ovens. In places that were remote from sources of ovenstone, it is likely that stones would be conserved for reuse, even when broken. There is evidence that preferred ovenstones were transported to places without suitable local stone. For example, Petchey (1993a) documented that river cobbles from the western side of Tauranga Harbour and marine boulders from the coast north of the harbour were transported

to Matakana Island for use as ovenstones—Matakana is entirely built of sand-sized Pleistocene and Holocene sediments, and lacks any rock suitable for earth ovens. Other parts of the Bay of Plenty are also deficient in rock suitable for ovenstones, while other locations were known as sources. One of these—Moutohora Island—is still used (Anon. 2003). It is likely that other islands were also used as sources of ovenstones. A traditional story cited by Matheson (1979: 1) has references to ovenstone sources at Waikoroa on Motiti, and at Maketu.

Reed (1958: 100) mentioned a beach on Lake Rotoiti ‘famous for its boulders’, ‘round and convenient in size’—for ovenstones—but did not give more precise location details. Stafford (1996) did not address this matter, but inspection of his maps shows a place at the eastern end of the lake where wave fetch would be effective in producing waves that would create a boulder beach. This beach has the name Te Umutahanganui (Stafford 1996: 155), which could be translated as ‘large bare oven’.

Some premier stone resources were brought into the area either in finished or partly finished form. Argillite from the northern South Island was used in early forms of adze. Maori in the Bay of Plenty also used nephrite (greenstone, jade), which was only available from the South Island. An abandoned nephrite slab has been discovered in the ranges between Taupo and Hawke’s Bay (Keyes & Matheson 1970), showing that the nephrite trade was in part overland and involved unworked stone as well as finished artefacts.

8.2 EUROPEAN RESOURCE USE

8.2.1 Trade and demand for new resources

The European traders and colonists were reliant on manufactured goods that made their lives less burdensome. However, many of the earliest settlers had very little in the way of funds with which to acquire these on an ongoing basis, and little land on which to produce crops. Hence they needed goods to trade. For traders, such goods were provided by Maori and then on-sold. However, Maori did not allow this trade to be monopolised by Pakeha, and soon acquired vessels so that they could move their own produce to the emerging Auckland market, which flourished up to 1858 (e.g. see Walker 2007: 63–66 for Whakatohea).

After the New Zealand Wars ended locally in 1865, the colonists’ desire for land could be satisfied from confiscated land and from more ready land sales. However, Te Kooti’s insurgency, which continued until 1970, was an ongoing constraint on development in the Bay of Plenty for several years after war ceased in other parts of New Zealand. Farming was also constrained by bush sickness (cobalt deficiency) and, particularly, by the lack of access to markets. The extensive coastal swamps were a barrier not only to transport but to development, as their agricultural potential could not be realised until they were drained.

The timber resource was initially difficult to access in much of the Bay of Plenty region, and its development came late compared with other areas, e.g. parts of Auckland province, which had more accessible timber and

better water transport. Maize cropping by Maori farmers had become well-established before the New Zealand Wars, and after the wars European settlers also began to grow it extensively. During the late 19th century, dairying expanded, with first cheese then butter factories.

Precious metals, particularly gold and silver, were present in the northwest of the Bay of Plenty region, but large reefs were rare. Mines required capital to be developed and even the best reefs were not economic to mine until the cyanide process was developed in the 1880s. Sulphur was another mineral resource in the region, although in limited quantities. Where water transport was available, it was one of the earliest minerals mined.

The energy and exotic forest potential of the Bay of Plenty did not start to be developed until the 19th century.

Tourism to the Rotorua district flourished for a short period after the New Zealand Wars, but declined substantially following the Tarawera eruption. It only started to recover after the North Island railway was extended to Rotorua in 1894.

8.2.2 Local development of opportunities

Port development in the Bay of Plenty paralleled the development of roads and was much in advance of railway development in the region. This seems to have been led by local initiatives. The coastal ports were tiny and economies of scale were limited because of the small size of the vessels that could use most of them. Roading development was, in part, politically driven, with central government funding roads to Rotorua from Tauranga and on to Taupo and Napier. The Taupo-Napier road had strategic importance in placing a southern boundary around the Ureweras. Some roads were constructed by Maori under contract. Coastal and other internal routes took longer to develop.

Although the goldmining town of Waihi, on the western edge of the Bay of Plenty, was a major industrial centre, it had little effect on development in the region. Some Bay of Plenty produce was sold to miners, and timber harvested in the northern Kaimai Ranges was used as underground roof supports in the mines. Waihi lacked the sea access of Thames, which became the manufacturing centre for the mining industry in the region. There was little direct spin-off for the Bay of Plenty from the Waihi mines.

Indigenous timber exploitation started around Tauranga after other northern resources were exhausted. It then became economic to build the *tramways* needed from the bush to the harbour shore, starting around AD 1900 (Stokes 1980: 270).

The opening of the railways (see section 11.4.4) allowed greater exploitation of all resources in the region. At Rotorua, this was primarily tourism, but dairy farming, indigenous logging and sulphur mining followed. The coastal railway only became effective after a bridge was built across Tauranga Harbour in 1924. This allowed indigenous forest logging to expand along its route and, in parallel, the expansion of the dairy industry, which could then access the rich soils of drained swamplands in the east of the region.

The Tauranga area pioneered the domestic and rural use of electricity in New Zealand (see section 11.4.3). Local hydroelectric resources were being developed, but it was the vision of one man—Lloyd Mandeno—who took

power to the domestic market for more than lighting and who pioneered single-wire, earth-return, rural reticulation, making the cost of reticulation affordable for rural customers (Mandeno 1975).

The modern agricultural landscape in New Zealand makes intensive use of many exotic species, a large number of which now have varieties that were specifically selected or developed for New Zealand conditions. The Bay of Plenty seems to have played a part in the adaptation of only a few species for local conditions, but these few were significant. The golden queen peach (*Prunus persica*), ideal for canning, is the result of local breeding. Matheson (1979: 39) claimed that bumble bees (*Bombus* spp.) were introduced to New Zealand at Motiti in 1887, but it is not stated which species. These bees are much more successful in fertilising red clover than honey bees and hence contribute significantly to the nitrogen-fixing clover grasslands that are so central to the success of New Zealand pastoralism. The Hayward kiwifruit (*Actinidia deliciosa*) variety, which is vital to modern fruit cropping in the Bay of Plenty region, was bred outside the region, but the most recent development of new varieties, including Zespri Gold, has taken place in the region at Te Puke. Development of varieties of radiata pine (*Pinus radiata*) for local conditions has been led by the Forest Research Institute in Rotorua.

The maps in the New Zealand Historical Atlas (McKinnon 1997) show, almost without exception, the slight nature of development in the Bay of Plenty until the late 20th century. The modern wealth of the region has not been built on extractive industries. Capital-intensive forestry, forest product processing, energy and agriculture were the basis of the rapid growth of the region in the late 20th century.

9 Maori settlement pattern and character

9.1 ARCHAIC OCCUPATION

The earliest cultural manifestation of Polynesians in New Zealand is usually termed *Archaic*. Archaic Maori occupation is distinguished by a number of cultural markers, particularly tools and ornaments that have links to Eastern Polynesia. The well-known sites of this cultural stage include Mt Camel at Houhora, Northland, Wairau Bar in the northern South Island, and numerous sites in coastal Otago. Archaic sites are often marked by use of stone resources transferred from remote locations in New Zealand and by use for food of marine and terrestrial animals that later became rare or extinct. In contrast to the areas mentioned above, the number of sites of Archaic occupation known in the Bay of Plenty area is small (Fig. 3).

It is clear that Archaic occupation sites were present at Waihi Beach and Bowentown (Mair 1902; Mitchell 1939). Phillips (2000a) recently reviewed the attempts to relocate the Bowentown site that was recorded in 1977 as U13/149. It may still be possible to relocate this, but its loss to erosion must be considered a possibility. An Archaic site has been reported at Kauri Point inside the north entrance of Tauranga Harbour (U13/1), but it has not been investigated archaeologically. An Archaic-style adze is known from this site, which reportedly contained moa bone.

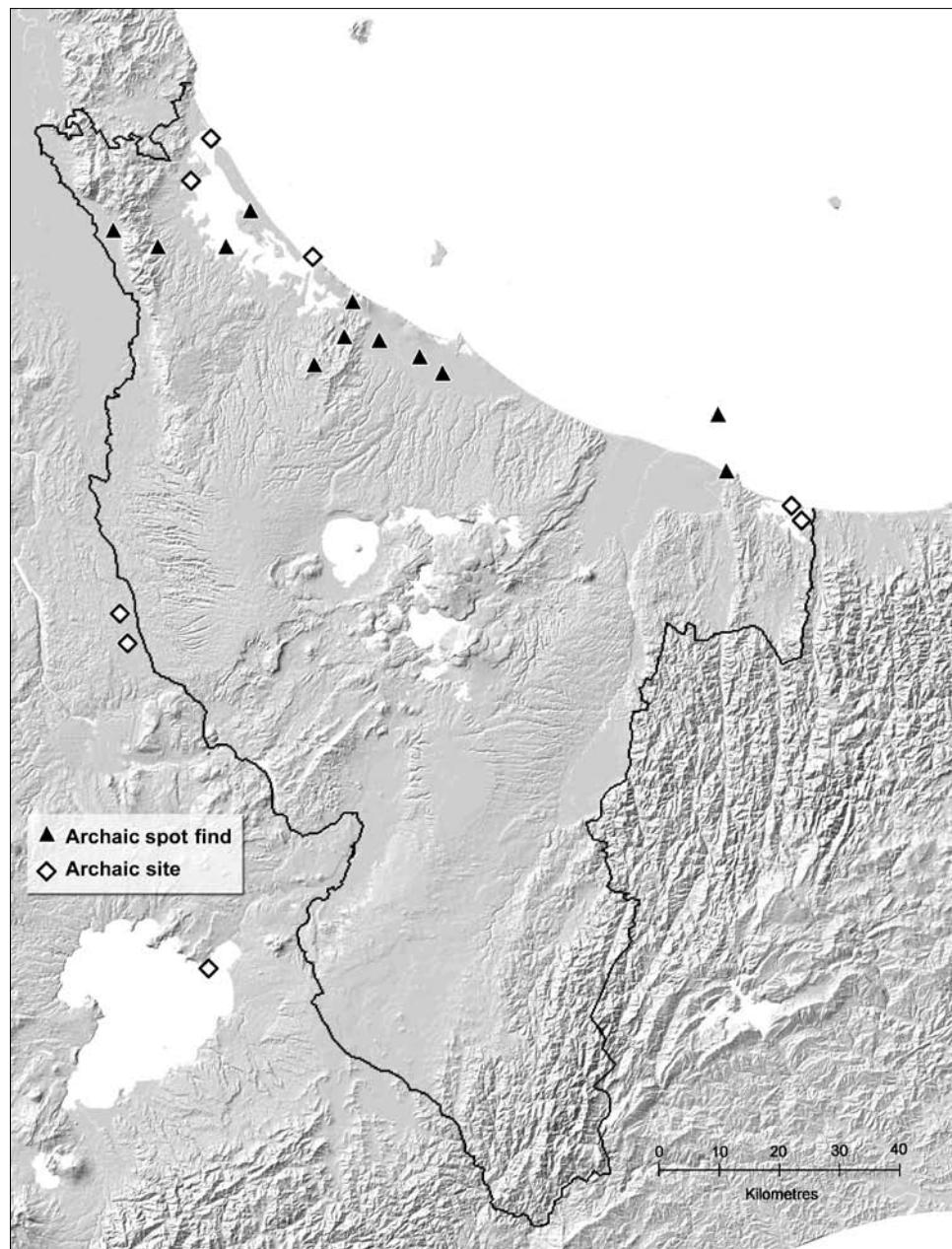
Kath Fletcher monitored material exposed by coastal erosion after storms at a number of locations in Pilot Bay on the inner harbour side of the Mt Maunganui tombolo. Her finds have made it clear that an Archaic site (U14/363) exists or existed there. Items found have included drill points, bone one-piece hook cores, a bone tab prepared for a hook, a 'point' of bird bone, broken pieces of bone hooks, flakes from polished tools, broken stone files, a Duff 4A or 4C adze, basalt, obsidian, chalcedony, chert and occasional argillite flake material (pers. obs.). The original site is not now apparent, but part of it may still be intact.

It has recently been demonstrated that the old shoreline inside the river mouth at Whakatane had Archaic occupation. This is not surprising given that an Archaic reel ornament was discovered near Whakatane (Leach 1983). No further information is yet available.

A site at Ohope Spit was excavated by members of the Whakatane and District Historical Society from 1969 (W15/82; Moore 1972). Phillips (1996) provided an overview of the results from this site. The fishing gear found is clearly of the Archaic period, but the site has not been dated.

Inside Ohiwa Harbour on its eastern side, the Tokitoki Archaic site has been excavated by McGovern-Wilson (W15/582). Formal reports have yet to be published, but various brief accounts show that the site contains moa bone from moa hunting, massive obsidian tools, tools made from stone from other parts of New Zealand, including the South Island, and bone fish hooks. Harbour shellfish is dominant in middens at the site, but these deposits are

Figure 3. Distribution of Archaic spot finds and Archaic sites in the Bay of Plenty region..



of more recent origin. Rick McGovern-Wilson (pers. comm.) reports that the site was first occupied soon after the Kaharoa tephra was deposited, for there is little sign of soil development on this underlying layer. McGlone & Jones (2004: 40) reported that obsidian hydration dates from the site are in the range of 650–690 years BP. Radiocarbon dates from the locality are listed in Appendix 2. In the absence of an excavation report, it is not appropriate to interpret these.

Although no Archaic sites have been reported from inland areas of the Bay of Plenty region, their presence just outside the region at Tokoroa and Taupo is a reminder that their possibility cannot be excluded. Spot finds of Archaic-style adzes and ornaments are known. Moore (1977), in reviewing the adzes in the Whakatane Musuem, noted many of Archaic form that were located only very generally in the Bay of Plenty. A surprising proportion of these were made from Nelson argillite, which may have resulted from such adzes being preferred by donors or by the Museum.

The distribution of adzes made of Tahanga basalt (from Opito in the Coromandel) extends into the Bay of Plenty area (Moore 1971). This distribution reflects an early northern North Island pattern, but does not necessarily provide a time marker, as the quarries at Opito were used later in Maori history as well. There is an interesting cluster of spot finds of adzes inland from Maketu to Tauranga, which are not matched by known Archaic sites. These may, perhaps, represent later transport and use of earlier styles of adze, but may also indicate that earlier sites could yet be found in these localities.

Obsidian from Mayor Island (Tuhua) is found in the earliest sites throughout New Zealand. This is a clear indication that the Bay of Plenty area was at least visited by people from the earliest occupation period of New Zealand, and that these people likely exchanged goods with people from other parts of New Zealand.

The Kaharoa tephra puts a lower time limit on the settlement of the Bay of Plenty. No pre-Kaharoa occupation site has ever been found in the region, despite this being the subject of some attention and even a few prospects, which turned out to be false. As noted in section 5.7, there is only slight and equivocal evidence of occupation from studies of pollen in sediments below the ash (i.e. possible signs of human disturbance of the vegetation). If the Kaharoa eruption occurred after human occupation of New Zealand, then it was only very shortly after.

The locations of the coastal Archaic sites are typical of these sites—sheltered beach-front sites just inside the mouths of harbours and river estuaries. Figure 3 illustrates the locations of Archaic material from the Bay of Plenty area. Such sites are infrequent in comparison with, for example, the Coromandel area. The absence of inland early sites is not likely to persist with further fieldwork, as the inland area is relatively little explored archaeologically and the presence of sites at Tokoroa and Taupo, just outside the Bay of Plenty region, points to the likelihood of more sites being found.

As so little has been published on the Archaic sites in the Bay of Plenty Region, little can be said in summary. The artefacts recovered exhibit the normal range of Archaic forms of adzes, fishhooks and ornaments, but they are not sufficient in number to help define any local variety to their manufacture. The economy of the occupants is hardly known at all beyond the fact that there are two sites with moa associations so, presumably, some of these birds formed part of the diet of the earliest people in the region. McFadgen (2007: 175) took the view that most moa bone reports from the area are of sub-fossil bone—that is, bone collected for industrial use from long-dead animals. We know nothing about the form of the Archaic settlements.

This sparse evidence of early occupation in the Bay of Plenty region requires consideration in the wider New Zealand context. Why is there such an apparent paucity of evidence of Archaic settlement in this region? The Bay of Plenty is not in the drier east coast areas where large Archaic sites have been found that have frequent evidence of moa use, but nor is the adjacent Coromandel, which also has higher densities of Archaic sites. One possible explanation is that the Kaharoa eruption, which perhaps continued in its dome-building stage during the earliest period of settlement, may have made the region appear dangerous and unattractive (because of volcanic activity, tephra damage and extensive un-vegetated outwash plains) Jones 1991; McGlone & Jones 2004). It is likely that many of the rivers in the

region would have had high levels of sediment and acidity, and the tephra-covered landscape would have been unappealing for horticulture. However, the extreme effects of volcanism were unlikely to have lasted more than a few decades. Tsunami activity from the Kermadec area may, likewise, have been a disincentive if a tsunami had occurred early in the settlement period. However, the effect of a tsunami would only be particularly apparent at the time it occurred and shortly after, and human memory of these events is normally short.

Although some sites may have been lost to erosion through the movement of estuary and river mouths, the more mobile shores of these areas would not have been preferred locations for more permanent settlements because of the remoteness of fresh water and suitable gardening soils. Recent loss of old sites seems an unlikely explanation for their scarcity: modern human development in the Bay of Plenty has been concentrated in the late 20th century, by which time important sites would not have been found or destroyed without coming to the attention of someone. The fact that sites have survived and been recorded in just the places we would have expected them suggests that the low frequency of recognised Archaic occupation sites reflects the reality that they are rare in this region.

McFadgen (2007: 173) took the view that the peculiar pattern of Archaic sites is probably the result of geological events that struck the coast early in its human history; specifically, the Kaharoa ash fall and tsunami. He does, though, credit the Kaharoa event with leaving soils well suited to later Maori horticultural use. The apparently rapid occupation of the Bay of Plenty area, with some tribal groups originating here but then moving away from the area, sits in contrast to the low intensity of Archaic occupation. The later population seems to have developed from a small base. Thus, perhaps it is our recognition of early sites that is at fault—sites may be more varied in location and content than the coastal artefact-rich sites we consider to be normal.

9.2 LATER PREHISTORIC OCCUPATION

Table 3 shows the prominent Maori site types recorded in the Bay of Plenty region. Their inclusion as Maori sites is one made by the recorders of the sites. The greater part will be pre-AD 1860.

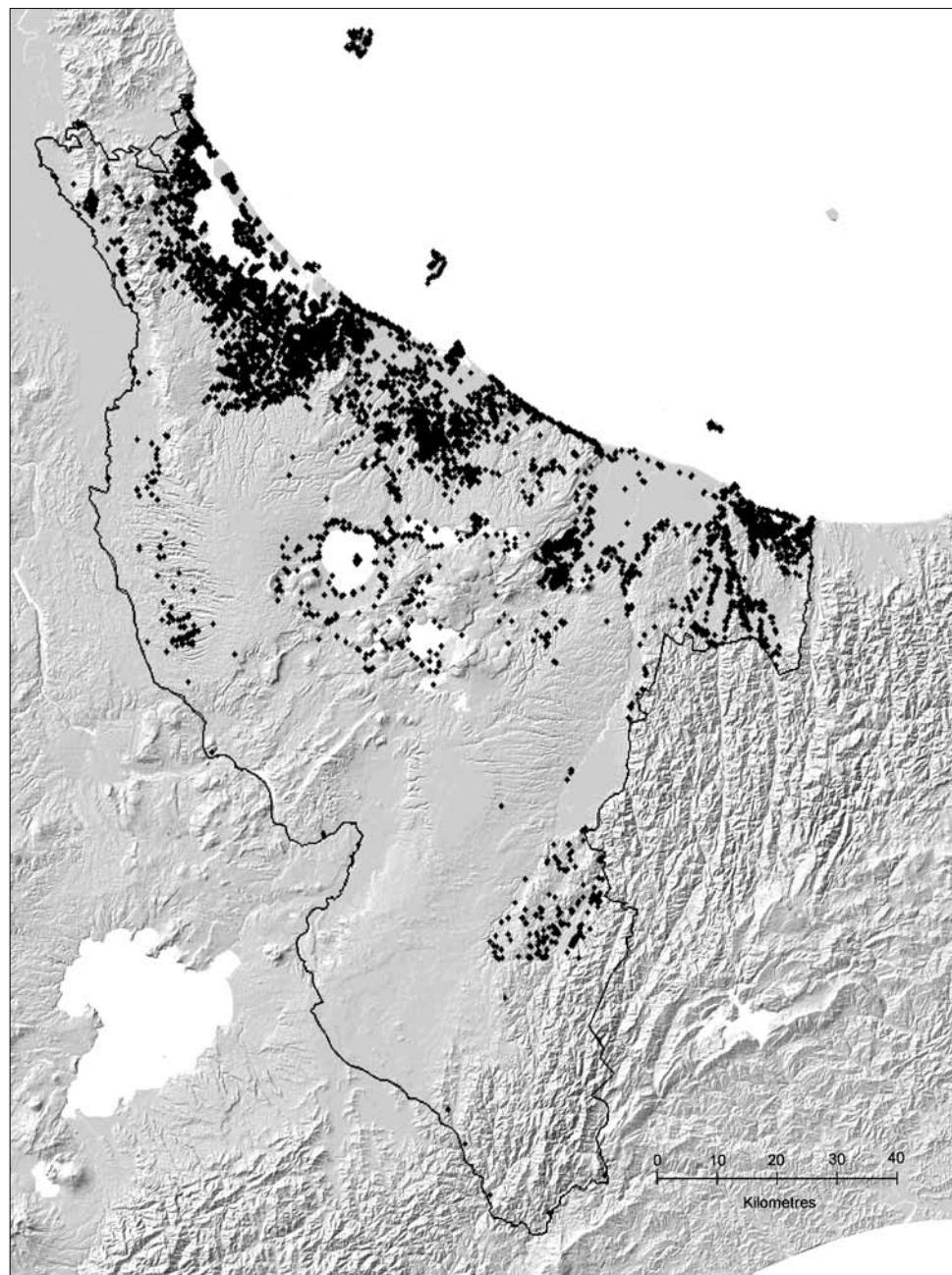
Table 3 includes a few Archaic sites, but the majority are from later periods of occupation. They are shown in map form on Fig. 4.

Leathwick (2000) related the density of pa and pit sites to physical and climatic factors and produced a predictive density map for New Zealand. For the Bay of Plenty, this

TABLE 3. MAORI SITE TYPES.

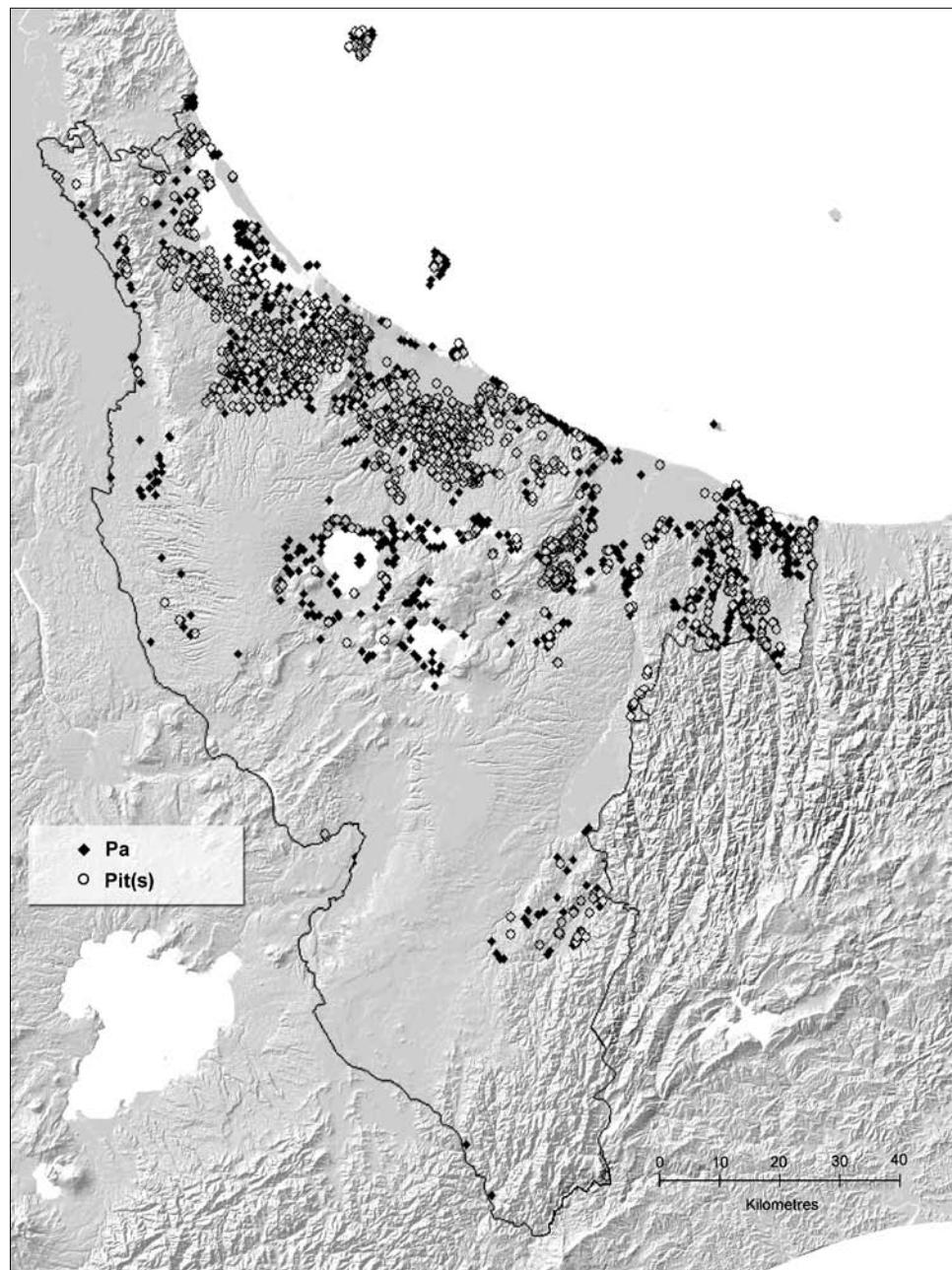
DESCRIPTOR (SEE GLOSSARY)	NUMBER
Pa	1177
Pit(s)	1353
Rua	230
Terrace(s) or platform	903
Midden	2644
Pit(s) and terrace(s)	372
Midden and pit(s)	59
Midden and terrace(s)	121
Hangi or hangi stones	13
Find spot	179
Cultivated soil	17
Burial or urupa	35

Figure 4. Distribution of recorded Maori sites in the Bay of Plenty region.



map is a very good predictive tool for the location of such sites (Fig. 5), and where this map departs from patterns known from survey, the reasons are rational and can be explained. The coastal sand strips are predicted as having high densities of pa and pit sites, but fewer sites than predicted have been recorded to date: these areas are not preferred for pa as they are hard to defend, and while archaeological pit sites are known in this zone, pits are inevitably infilled so field survey will not often reveal them. The swamp areas behind the shore near Papamoa, Maketu and on the Rangitaiki Plain are also predicted to have a high density of sites, but the actual density is low: pits are not a practical storage solution in swamps, other than on occasional areas of higher land, and swamp pa, while being present, do not occur as frequently as upland pa.

Figure 5. Distribution of pa and pit sites in the Bay of Plenty region.



9.2.1 Organised groups and settlement during the main period of prehistoric Maori occupation

The broad pattern of Maori occupation on mainland Bay of Plenty shows a preference for coastal sites, particularly at places with harbours or estuaries. The Rotorua Lakes were also a favoured place to live. The distribution of defended sites is similar to that for undefended sites, which indicates that stress between groups was widespread. The resources that made particular areas favoured for occupation are evident, and are discussed further in the relevant sections of this report. The archaeological evidence indicates that the collection of birds for consumption was less important than the grown, fished and gathered food resources.

The size of fortifications varies in the region. Large sites occur away from the immediate coast at Whakatane and at Papamoa. The fortifications at these

sites did not have to be large, as locations for smaller fortifications were available. This suggests that there was a particular reason for the large size—probably that at some time in the past large social groups aggregated for defence. Until more is known about the timing of occupation of these areas, little more can be said on the duration of such aggregations.

The archaeological evidence to date shows some variability over the Bay of Plenty region, such as the more eastern distribution of *rua* and the dominance of *pa* over other site types in the Rotorua area. However, such patterns may be artefacts of recording or survival. To date, no case can be made for larger social groups existing at a scale of organisation above a site on the basis of the archaeological record.

Kevin Jones (DOC, pers. comm.) believes that occupation of the Waimana and Opouriao valleys in the east of the Bay of Plenty region commenced in the 14th century, with the onset of *pa* building in the mid-16th century and the *pa* continuing to be used until the early 19th century. There are two types of *pa* in these valleys: ridge *pa* with transverse ditches; and *pa* with lateral and transverse ditches encircling the defended area, which are often continuous with naturally steep slopes that do not require further fortification. According to Jones, the size of *pa* and the density of their distribution on river-cut high terrace lands and at gorge entrances are also of note. Although all the *pa* need not have been occupied at the same time, Jones has suggested that their size and density does indicate considerable populations cultivating river terraces and the Urewera foothills. He has also noted (in respect of the large *pa* in this area) that identifying a *pa* as a neat unit of fortified land is difficult in some places and that Hui te Rangiora (W16/85), and the ridge on which Te Koau (W16/93), Rimuhongi (W16/198) and Te Puehu (W16/236) were constructed may be better seen as defended complexes of *pa* in which leading ridges were scarped and trenched as the need was seen.

Jones (pers. comm.) has described the sites of pre-European origin (i.e. *pa*/obsidian *find spots* in association with pits) as being predominantly in the northern parts of the low-altitude dissected terraces, near Te Whaiti, but not on the valley floor. He states that pre-European settlement also spread up rivers (such as the Managawiri) west of the main valley and that this pattern was overlain by the pattern of 19th-century settlement. This later settlement occurred not only on the same sites as the pre-European settlement, but also extended out to the margins of the habitable area of the southern hill country in a much more extensive fashion than the prehistoric settlement.

There is evidence of active clearance of the forest in the early 19th century. Jones (1983b) made a case for the growth in 19th-century occupation being initiated by the ability to grow the introduced potato in the area. The sparse occurrence of archaeological sites in the Rangitaiki Valley to the west of Whirinaki is very notable. Differences in survey effort may explain some of this, but it is consistent with a low Maori occupation in the early 19th century and needs further explanation.

Edson (1973) made a strong case for Motiti being the most favoured site of the offshore islands in terms of its assets for human use. This is borne out by the density of sites on the island (Walton & McFadgen 1990). Clearly, it was a favoured place for residence for a long period. Its traditional and more recent history has frequent reference to dispute over its possession.

Kahotea (1983) reviewed the settlement patterns of Ngaiterangi and their allies around Tauranga Harbour through the period of the Musket and New Zealand Wars from 1820 to the 1860s. There was some contraction at the coastal territorial margins as a result of assault from outside, but the general pattern of larger permanent fortified settlements on the harbour margin, with some dispersed gardens up to the bush-line, was stable for much of the period. It was only following British military intervention in 1863 that there was a radical increase in inland settlements. These lasted only a short time before most occupation retreated back to the harbour edge, quickly followed by undefended settlements in that location. The review of hapu land claims provided by Kahotea (1983: 83) shows an interesting pattern of settlement areas radiating out from the harbour and along the navigable Wairoa River, illustrating the importance of both harbour and inland resources.

9.2.2 Fortifications

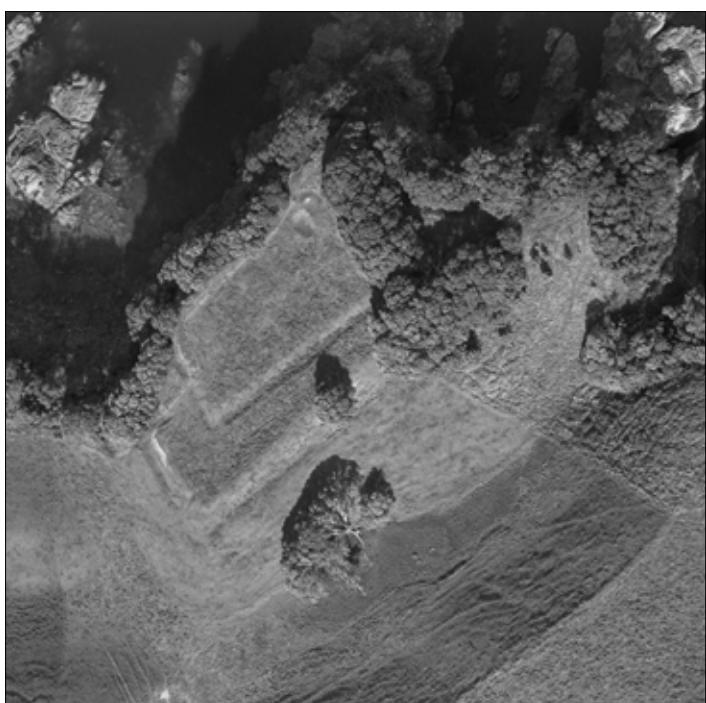


Figure 6. Pa on Motiti Island, oblique aerial photo.
Photo: K. Jones, DOC.

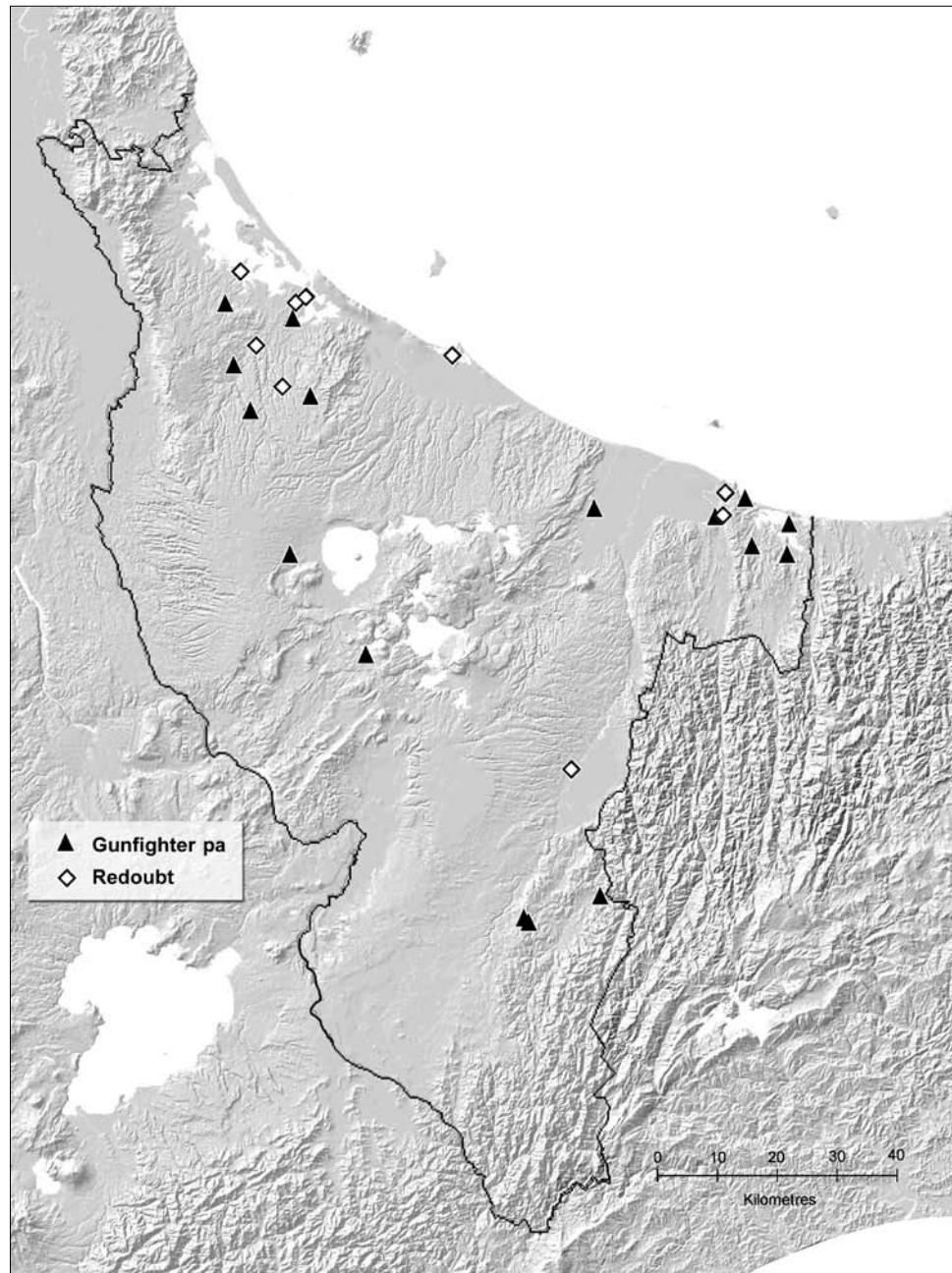
Pa sites are common in the Bay of Plenty region (Fig. 5); many have been accurately mapped and a number archaeologically investigated. A typical pa is shown in Fig. 6. The overall pattern of distribution is similar to other areas with substantial Maori settlement, as pa constitute a sizeable proportion of the total number of recorded Maori archaeological sites. The distribution is primarily coastal, with some additional sites along the western side of the Kaimai Ranges, and some inland sites around the Rotorua Lakes and on the western margins of the Urewera ranges. Pa sites are infrequent, or unrecorded, in the inland Rangitaiki Valley. Pa with features showing they were adapted for gun fighting are quite common in the region (Fig. 7).

Swamp pa have been found at Papamoa and on the Rangitaiki Plain. One of these has been the subject of a major investigation

(Irwin 2004). Swamp pa had defences that were greatly reinforced by their location in a swamp; palisades were usual, and the living areas may have been deliberately built up or constructed on remnants of dunes that rose above the wet areas.

Groube (1970) classified pa into three classes. All three of his classes are present in the Bay of Plenty region, but the region is particularly notable for the frequency of his class 3a and 3b pa—ring ditch and ring ditch with associated terraces—which (except for Taranaki) are rare elsewhere in New Zealand. O'Keeffe (1991) and Phillips (1996), in their respective studies of the western and eastern parts of the Bay of Plenty region, attempted to determine whether the class 3 pa were of more significance at one particular time, and looked for other associations—but with negative results. It seems that if pa defensive features are to be of broadly typological value (in terms of determining period or cultural affiliation), the Groube scheme will need

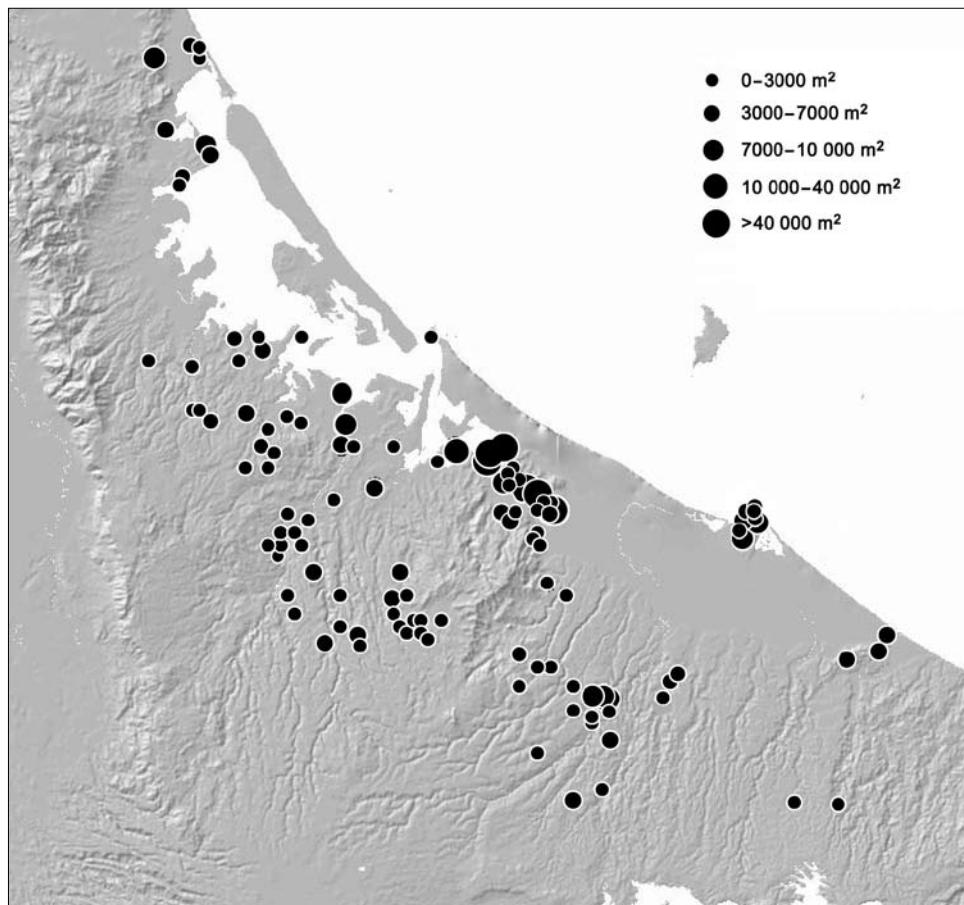
Figure 7. Distribution of gunfighter pa and redoubts in the Bay of Plenty region.



to be improved. A statistical investigation that extracts multiple characters from detailed pa surveys may provide a way of classifying pa. A study along these lines is needed.

Because pa have been well surveyed in the Bay of Plenty region, the way in which large and small pa are distributed is now known for some parts of the area. O'Keeffe (1991) and Phillips (1996) have mapped areas showing pa sizes. In the western Bay of Plenty, there is a remarkable concentration of large sites on the Papamoa hills and just east of Tauranga Harbour (Fig. 8). Around the Ohiwa Harbour to the east there are no similar concentrations and distribution is more general (Fig. 9), with a small concentration on the Hiwarau ridge east of the Nukuhou River. Detailed mapping of sites near the Whakatane River, from the Whakatane Headland south to the vicinity of Ruatoki/Waikirikiri, has revealed a series of large sites, none of which were

Figure 8. Pa sites in the western Bay of Plenty (after O'Keeffe 1991). There is a wide spread in site sizes. The larger pa cluster strongly around the Papamoa hills and Maketu has notable concentrations. Note: pa on the Tauranga Harbour islands, offshore islands and in the Rotorua Lakes catchments are not shown.



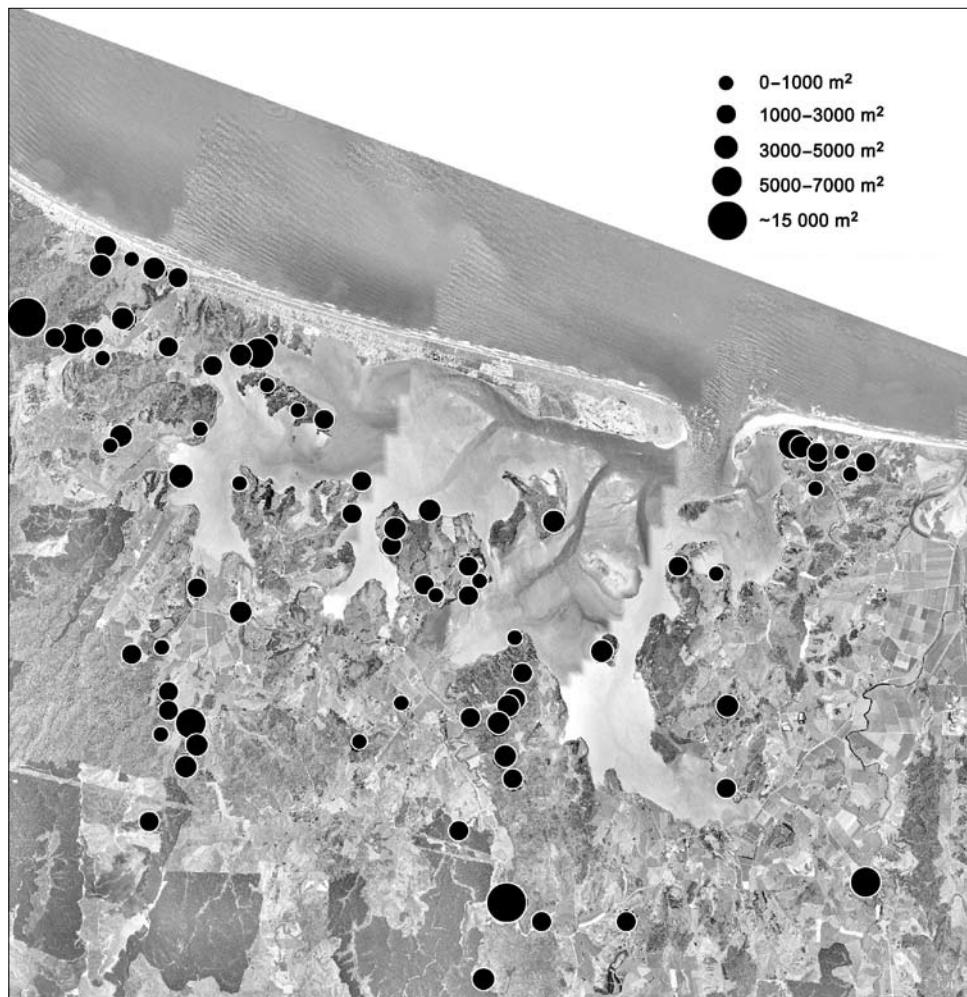
occupied during the *contact period* (e.g. Fig. 10). This pattern has also been identified on the Auckland Isthmus. Walton (2006) has analysed the size distribution of a number of samples of pa from throughout New Zealand. The western Bay of Plenty pa stood out as having a high proportion of large pa (over 5000 m^2). Using this measure, the Phillips sample from the eastern Bay of Plenty was not distinguished from pa elsewhere.

A remarkable series of sites (V17/12, 34, 75, V18 /13, 38 and 39) in the Whirinaki River valley in the southeast of the region had standing palisade posts at the time they were first recorded. Some of these also had recently fallen posts. They would appear to be relatively recent in age, and were perhaps in use as late as the 1870s.

Major pa excavations are addressed in section 10 of this report. Two noteworthy excavations at Rotorua and Whakatane, which are not discussed in section 10, are covered here.

The Rotorua excavation was a mitigation excavation of a promontory pa (Kahotea 1988; U15/35). Few sites have been investigated in the Rotorua area. The site had rectangular pits, kakahi (freshwater mussel) midden and a palisade along the defensive bank. Five radiocarbon dates on unidentified charcoal were taken from the site (see Appendix 3) (the exact locations have not been published). Three gave modern dates and the other two were not helpful, giving a time between the 15th and the 18th centuries, possibly also affected by inbuilt age.

Figure 9. Pa sites at Ohiwa (after Phillips 1996). The spread in site sizes is still wide, but the large sites are smaller than at Tauranga. While there is clustering, the two largest sites stand apart from it.



The second example was another mitigation excavation on a hill that proved to be a scarp-defended pa (W15/9) (McGovern-Wilson 1995b), one of many along the eastern escarpment of the Rangitaiki Plain near Whakatane (Moore 1973, 1974; K. Jones, pers. comm.). Three rua were found in the limited area exposed, one of which contained a burial, the skeleton's disarticulation being consistent with its being the result of cannibalism rather than a secondary burial (i.e. a complete skeleton that had become disarticulated and then re-buried). Associated with it were the remains of at least three dogs. A skeleton of a puppy was found in another rua. Kaka bones were found in the burial rua fill, along with shell midden. Radiocarbon dating of shell from the shell midden supports the backfilling of the rua between the mid-16th and mid-17th centuries. This also dates the burial, so the site provides important evidence of the antiquity of cannibalism. The relationship of the rua to the use of the site as a pa is not known. At the base of the rua with the burial, beneath the human remains, there was a thin layer of white sand, overlying some earlier midden and earth fill. The sand may relate to a prior storage use of the rua (see section 9.2.4). The animal species identified from this site are listed in Appendix 4.

Schmidt (1996) explored the history of construction of fortification in New Zealand. He concluded that pa construction commenced at about AD 1500. The evidence he reviewed included that for the Whakatane and wider Bay

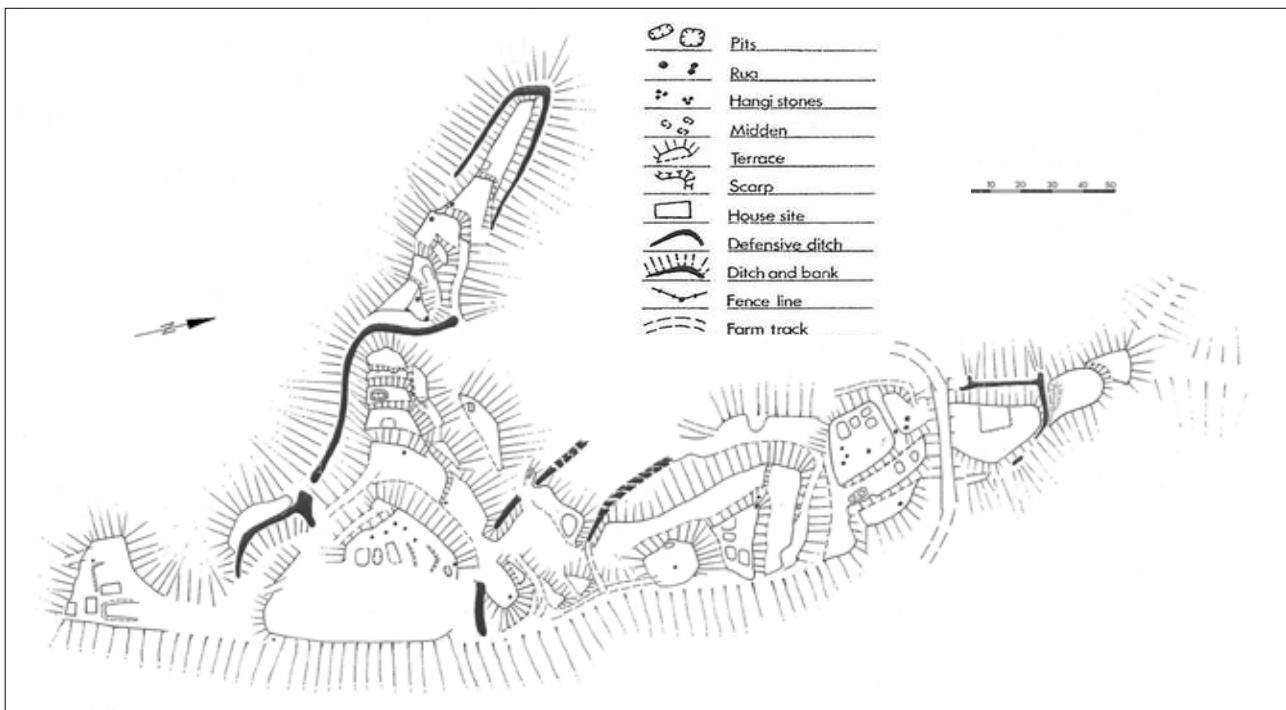


Figure 10. Pa at Ruatoki, W16/167.

of Plenty region. This is a plausible date for this region, as can be seen from the individual site reviews. It shows that the emergence of a perceived need for security in the region occurred as early there as anywhere else in New Zealand.

9.2.3 Terraces

Terrace sites are common in the Bay of Plenty and may or may not be associated with pits or midden. As noted in the section under pits in the field records, terrace sites are more likely to have midden associated with them than are pit sites, which is consistent with terraces having a primarily domestic (housing) function. On excavation, terraces often turn out to be part of wider site complexes. In the Kawerau area, the Tarawera lapilli has filled most pits, so that the sites appear now as if they were simple terrace sites only.

O'Keefe (1991) has extracted the number of terraces per site from the recorded sites in the western Bay of Plenty. Single terraces occur most frequently, and the frequency of sites with larger numbers of terraces decreases regularly up to sites with about nine terraces. Thereafter, sites with larger numbers of terraces are more frequent than would be expected. This indicates that sites with ten or more terraces comprise a different population, perhaps the result of construction under different social circumstances than the smaller sites.

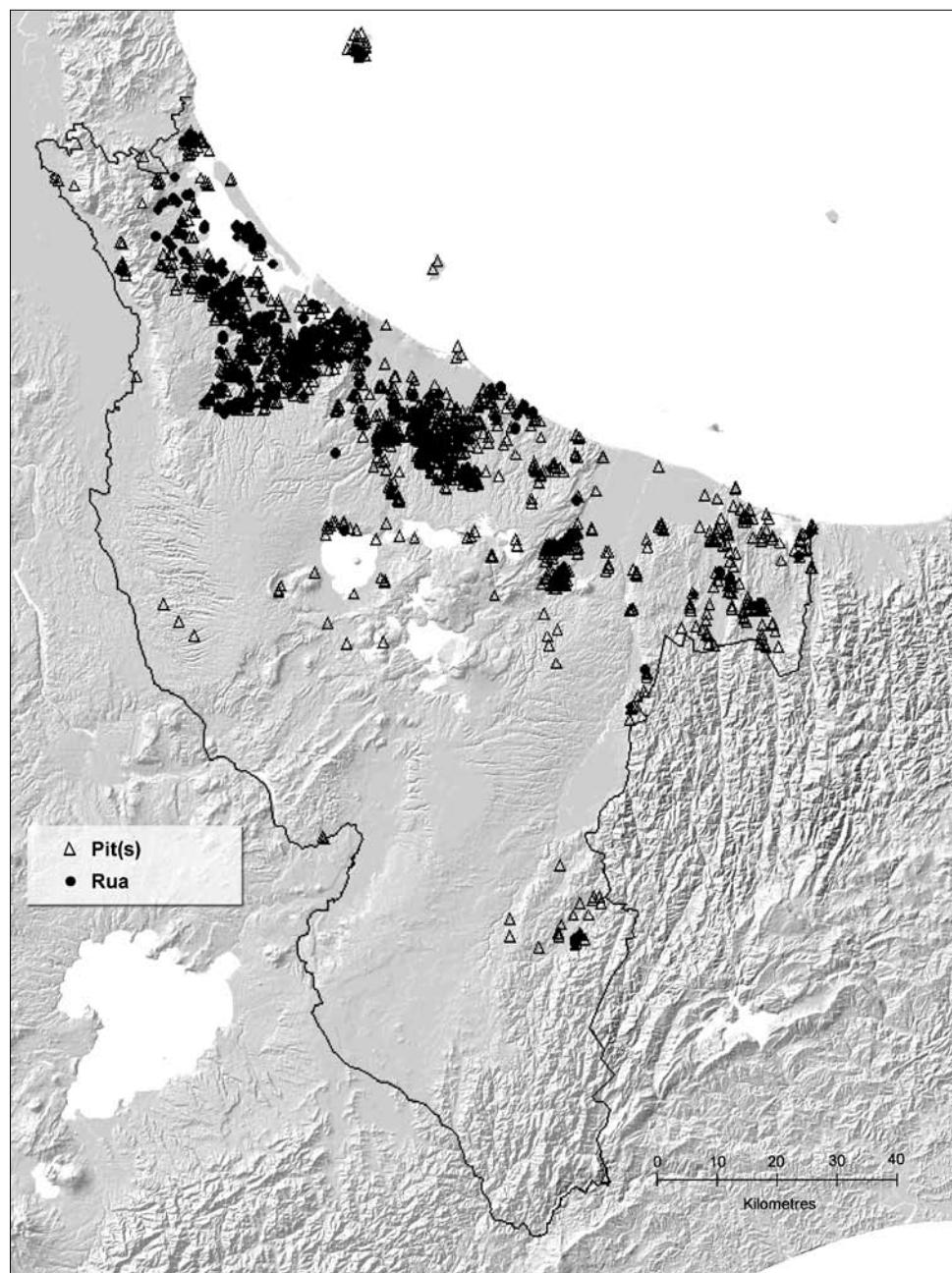
Undefended occupation sites are represented in the excavation record, most notably the Maruka research project at Kawerau (Lawlor 1981; Walton 1981; Furey 1983). Elsewhere in New Zealand, records indicate that some undefended sites have had long occupancies, and have yielded reasonably numerous artefacts. Such long-term sites have not, as yet, been identified amongst sites excavated in the Bay of Plenty (but see Jones (1984b) and Campbell (2004) for details of site excavations of other undefended sites).

9.2.4 Storage pits

Storage pits are either open rectangular holes on flat surfaces, or cave-like pits that archaeologists call *rua* (see Glossary). Sites with pits or *rua* are commonly coastal features, but are generally located behind swampy foreshore areas. *Rua* take a number of forms: caves cut in from natural escarpments; symmetrical bell shapes with top entries; and asymmetrical shapes with top entries. Some excavated examples are cut from the walls of entry pits on level ground. The distribution map from the site records shows *rua* to have a more westerly distribution (Fig. 11). However, both rectangular pits and *rua* are present throughout the area. The archaeological evidence shows that both have some antiquity. Both occur within fortifications and separate from them.

Bell-shaped *rua* were used for kumara storage as late as the 1940s on Motiti Island (Matheson 1979: 102). Hence they cannot be assumed to be pre-European

Figure 11. Distribution of pit and *rua* sites in the Bay of Plenty region.



just on their appearance. Matheson (1979) recorded them as being used with sand spread on the floor and kumara stacked against the walls, with a central clear floor space for access and the capacity to hold up to a tonne of tubers. Burials have also been recorded in rua (Coster 1977). These must have taken place under duress or be of low-status people, as the food association would normally have made such burials abhorrent, at least to modern Maori.

Rectangular pits with small hearths, grooved excavated walls, buttresses and differing patterns of floor post holes have been found. Lawlor (1983a) reviewed the various pits found at Kawerau in an important series of excavations. Some rectangular pits in the Kawerau area are very large—as much as 10×8 m in plan. Law (1999) identified a pattern of unusually long pits from the northern North Island. These included five sites from the Bay of Plenty: Ongare Pt Pa, Kauri Pt undefended site, Judea U14/2240 (McFadgen 1985b), and Kawerau sites V16/238 (Furey 1983) and V16/202. A further Bay of Plenty record obtained more recently is U14/2037 at Welcome Bay (Hooker 2000c). This is an infilled pit in an undefended site. It does not add anything further to the dating information. The very long pits seem to date from the 16th century. They are usually infilled and are on sites with other occupation evidence. They are not known as open surface features. The structures may have been used to display the wealth of the owners on the basis of the large amount of stored food.

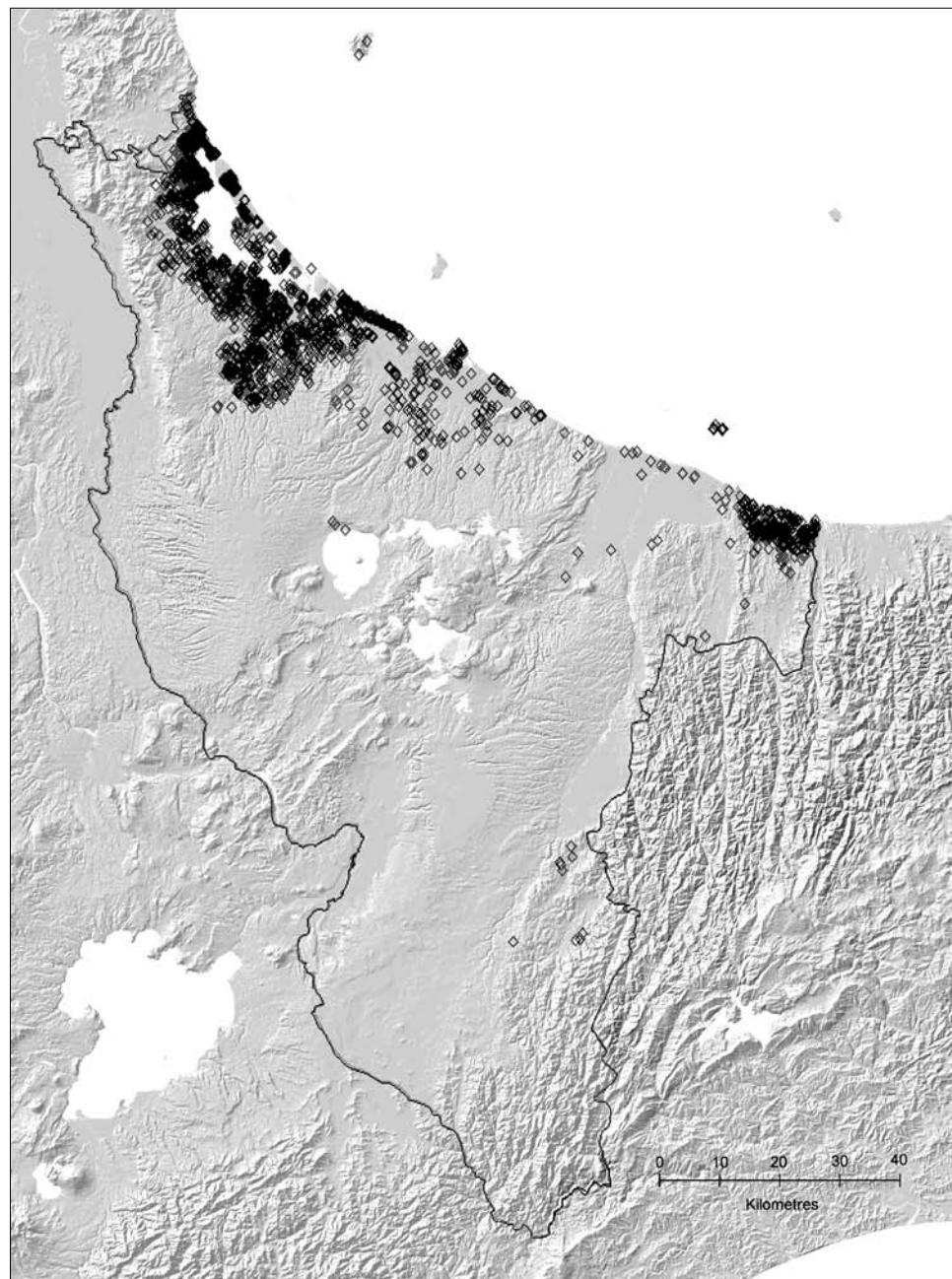
O'Keeffe (1991) has extracted data on sites with pits from the western Bay of Plenty. The number of sites with pits showing on the surface declines regularly up to sites with about five pits. Thereafter, the frequency declines more slowly but regularly up to sites with about 11 pits; there are a few sites with many more pits than this. Hence, there seem to be three patterns of pit sites: sites with one or a few pits, sites with 5–11 pits, and sites with larger numbers of pits. This may reflect the size of the social units responsible for the construction of the sites. Over the same area, the association of middens, as seen by the field recorders, is also interesting. Middens are far more commonly associated with terrace sites than pit sites. This suggests that many of the pit sites were not occupation sites or, if shellfish consumption was seasonal, it was not in the season when the pit sites were commonly used.

9.2.5 **Middens**

Figure 12 illustrates the distribution of recorded middens in the Bay of Plenty region. While their distribution is predominantly coastal, they extend well inland in places, particularly south of Tauranga and Maketu. There is a notable decline in their frequency from Pukehina to Te Teko, reflecting the absence of estuaries in that area and the steep, high-wave-energy beaches where shellfish are less common. The Tauranga area in particular has a very high frequency of middens. Disturbance of the ground in this area at any modest scale by cultivation or for earthworks often exposes middens. Such exposures are often indicative of other buried archaeological evidence, such as storage pits.

Appendix 4 summarises the animal species (other than shellfish) recorded from middens. Some of these records are from midden-only sites, but others are from more general sites that include middens. The paucity of bird and mammal identifications is startling. The fish identified cover the range of species that would be expected from the locations, demonstrating that

Figure 12. Distribution of middens in the Bay of Plenty region.



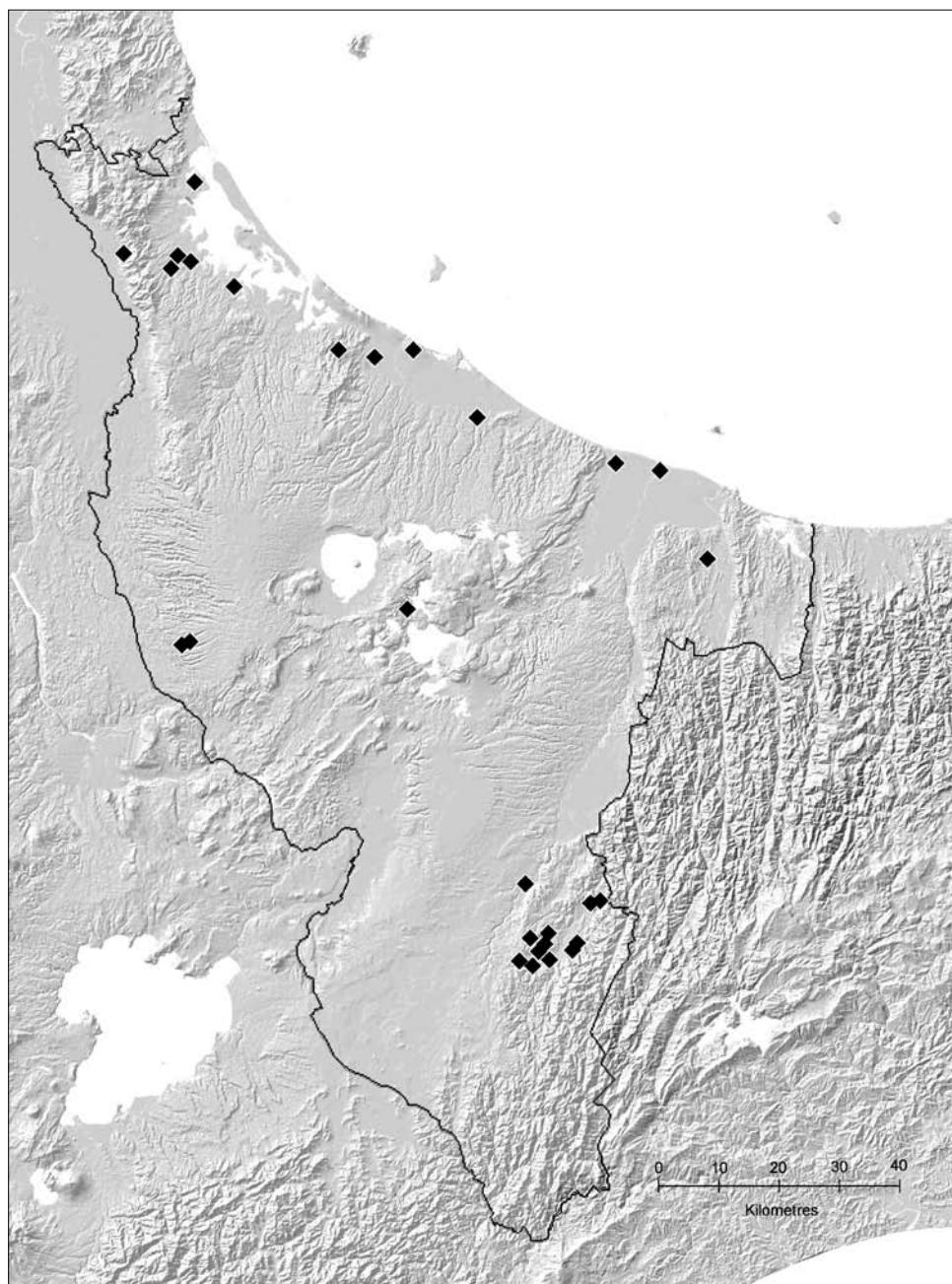
a variety of marine fish habitats must have been utilised and a variety of techniques used to catch fish, although there is little archaeological evidence of fishing gear. There are some gaps in species representation, however. Eels have not been identified in the midden contents, even though the alkaline environments created by shell middens aid the preservation of any included fish bone. However, shell middens become scarce inland in the areas where middens are most likely to have incorporated the very fine bones of eels. Hence, eel bones in these sites are likely to be unidentifiable or non-recoverable because they have been destroyed by acidic soil conditions.

Kakahi (freshwater mussel) middens occur around the Rotorua Lakes, and may provide better conditions for the preservation of freshwater fish remains. One analysis of a kakahi midden has been reported for U15/9 at Rotorua. The only fish bone found was believed to be blue mackerel (*Scomber austalasicus*)—a marine species (Campbell 2005: 106).

9.2.6 Wooden artefact find spots

Figure 13 shows the distribution of wooden artefact sites or find spots across the Bay of Plenty region. The number is not large for such an important site type or find. The concentrations shown inland from Murupara are the bird-snaring troughs mentioned previously (section 8.1.1) and the pa sites recorded with intact palisade posts. Other sites are generally close to other concentrations of evidence along the coast. There are likely to be more sites on the lowland margins on the western side of the Kaimai Range and wood remains in existing or former swamps. The practice of submerging canoes in lakes during times of stress (Smith 1953: 25) must leave some hope that they remain as an archaeological resource.

Figure 13. Distribution of sites yielding wooden artefacts (mostly wetland sites) in the Bay of Plenty region.



9.2.7 Religious sites

Tuahu (shrines) have been recorded in the area but not studied. Best (1924: 83) illustrated one that had four standing stones 'in the Rotorua district'. Simmons (1986: 32, Plate XX) illustrated a further site photographed early in the 20th century with stone paving and three upright stones. The location is not given, but there is an implication that it is Arawa. A further shrine is noted at Okataina (U16/20; Anon. n.d.a). Tuahu are frequently referred to in the early traditional histories of the region.

9.2.8 Rock and tree art sites

The site of longest record is the famous Kaingaroa shelter (V17/3), a few kilometres west of Murupara, which has a large number of canoe carvings as well as zigzag and ladder figures. The canoes have conventional Maori prow and stern pieces and are decorated with spirals. The site has been investigated and reported many times (Hamilton 1925; Davis 1958; Spiers 1971) and has been the subject of some inventive interpretation, such as suggestions that the carvings depict the Great Fleet (Wilson 1962). Early excavations in the shelter floor produced little archaeological material.

Ambrose (1961) recorded rock carvings in two groups at Ongare Point, including the front elevations of houses and canoes, some in relief and others incised. Some words in Roman letters led Ambrose to believe that the carvings related to the mid-19th century. Images of two canoes from this site were used as cover illustrations on the New Zealand Archaeological Association Newsletter volume 9, 1966.

A stone found at a pa site near Aongatete (T14/26) is recorded as having figures and canoes carved on it.

Stafford recorded rock paintings at Nga Rape O Tuahu at Rotoehu (Stafford 1996: 99, and illustration facing p. 97; 1999: 115), but noted there was some dispute a century ago about how recent they were. The figures illustrated appear to include red spirals.

Gregg (1956) recorded a rock drawing site at Tarawera (U16/11) that had been buried under sediment when the lake was dammed following the Tarawera eruption. The site had been excavated after the lake levels dropped. Ladder and canoe figures, mainly in red, were observed. Further painted or drawn rock art (a canoe in red ochre) is known from Okataina (U16/68) but has not been reported in detail.

The Rua Hoata shelter on the Waikato River (U17/3) had carvings on the wall and roof of canoes and one reptilian figure (Phillips 1947). Some 54 canoe glyphs of a variety of forms occurred, some in relief in profile, others canoe-shaped recesses in the rock surface. One was believed to depict an outrigger canoe, while another with a double prow was thought to be a double canoe. Another had a spiral design as decoration. One large canoe had writing on it, which Phillips believed was Maori in origin, but was possibly added later. The shelter had been explored at an earlier date, and kokowai, net fragments, a kit (kete), a flute, string, shells used as scrapers, fire sticks and fire ploughs were found. Phillips found remains of four more kete and a raupo sleeping

mat. Sadly, this shelter has recently collapsed, the victim of varying water levels in the river resulting from flow control for hydroelectric generation.

Site V14/179 on Motiti Island is recorded as having petroglyphs of spirals and grooves. At Moturiki Island (U14/448), a spiral carved on a rock has been recorded (Law 1969), and at the same site a hollow has been ground into the top of a rock (U14/364).

Although not strictly rock art sites, there are stones or stone surfaces where adzes have been ground, leaving wear grooves. One, from Matata, is now a prominent display item in Auckland Museum (Fulton 1921). Others are known from Rotorua, on an island just off Motutara Point (U16/110), east of Rotorua (U16/52), and on the shores of Lake Okataina.

Some remarkable rock art sites have recently been reported near Tokoroa by Fletcher (2002). He discovered a number of small shelters in ignimbrite cliffs, many with ochre markings. Most of the sites have a single ochre daub on the wall. Three sites have figures, which Fletcher suggested are a leaping figure (U6/128), a bird in flight (U16/126) and a *manaiā* (a stylised figure) (T16/79). This site also has a further figure that he did not try to interpret. The first two sites and a further site without figures also have many daub marks. Fletcher compared the ochre markings to other sites he has surveyed on the west side of the Waikato, outside the boundaries of the Bay of Plenty region.

Fletcher (2002) recorded two further shelters in the area with carvings. One (T16/96) has a canoe carving in relief with the conventional prow and stern pieces and 'KOTAINUI' ('This is the Tainui') carved along its length. There are also ochre markings at this shelter. The second shelter (U16/114) has incised figures that Fletcher interpreted as stylised birds. Other surface finds in this series of shelters were a waka huia lid in an undecorated shelter, two obsidian flakes, a chert flake, a Duff type 2B adze, a bird bone toggle, a wooden comb top and a stone pounder. This assemblage would certainly argue for pre-contact occupation, and the ochre markings are likely to be contemporary with that. However, the canoe carving with the lettering must relate to the period after the advent of Maori literacy. Its discovery makes it more likely that the canoe with writing at Rua Hoata had the lettering inscribed at the same time as the canoe was carved, suggesting a later age for at least some of the carvings there. Ambrose's conclusion that the Ongare sites' glyphs were all late in age (19th century) is also strengthened.

A similar site or sites has been illustrated by Tapsell (2006: 90) in the headwaters of the Pongakawa Stream, with red figures including a canoe on a shelter wall and an incised word 'Toa' in Roman upper and lowercase letters, also on a shelter wall. Stafford also illustrated this site or sites (Stafford 2007: 59 and coloured plate between 64 and 65). This is a remarkable series of sites that show that the body of known rock art from the Bay of Plenty area is not a closed book and can be expected to expand.

The Rotorua area also has a number of sites with rock figures in deep relief carved into a face or carved in the round (on all sides of the medium, to form a three-dimensional object). One is from a cave at Te Tihi o Tonga south of Rotorua (Simmons 1986: 27, Plate XIIa; Stafford 1999: 94). It is identified as a representation of Horoirangi, an Arawa ancestress. It was located by a stone-cut stairway leading to a storehouse cut into a cliff. The well-known double-sided figure on Mokoia Island (Simmons 1986: 30; U15/51) has the two sides named as Matutonga—the god of growth—and Matuatehe—the god of decay. Mokoia was a renowned kumara-growing area, so the first is certainly appropriate.

Two repeated themes occur in rock art from the area—canoe petroglyphs and the drawing of red figures. The association of figures carved in the round with ancestors and gods is consistent with carvings in houses.

A sole dendroglyph (carving on a tree) has been recorded near Te Whaiti (V17/1).

9.2.9 Unusual artefacts

An interesting group of artefacts are the so-called ‘bowling stones’ from the Tauranga area (Semadeni 1912). These are like small cheeses, rather dissimilar from the Tahitian discus-like bowls, which are thinner and have a perimeter notch. None of the stones are known from archaeological contexts. One precise find spot has been recorded (U14/429). They are not known from outside the Bay of Plenty. Gardner (1993) recorded the locations of some further examples, all of which seem to have been close to Tauranga—Otumoetai (2), Rangiwaea, and sand dunes at Mt Maunganui. Despite their physical differences from the Tahitian examples, it is hard to think of a better explanation for them than that they are bowling stones.

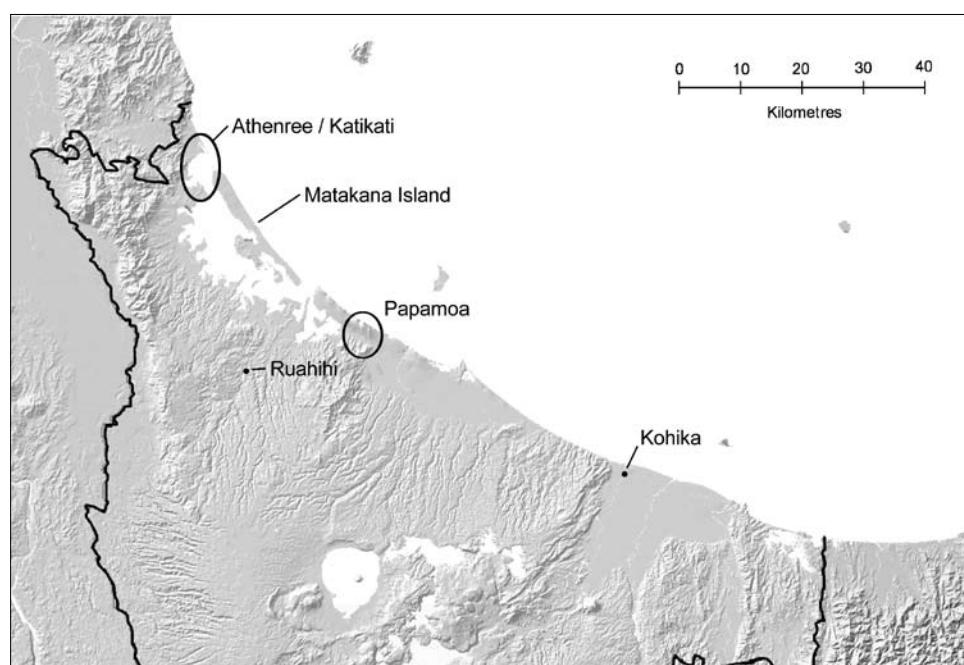
9.2.10 Boundary markers

Several sites in the eastern part of the region are recorded as ditches or ditch and bank fences. Downslope ditches are also associated with several pa in the same area. These are most likely to be boundary markers. On Mokoia, standing stones have been recorded from the part of the island previously used for gardens (U15/52); these may also be markers. Matheson (1979: 29) recorded a boundary ditch being dug across Motiti during land dispute in the late 19th century, perhaps continuing an earlier method of marking boundaries.

10. Specific areas

The preceding sections have dealt with general aspects of site distribution and settlement over the wider Bay of Plenty region. This section considers some specific areas in more detail to give an indication of the contribution that archaeology can make in gaining an understanding of particular areas at the scale of a single landscape and also to give a context to particular factors, such as the choice of technology and the use of local environments. The study areas (Fig. 14) have been chosen to represent a wide range of environments in which useful archaeology has been carried out.

Figure 14. Location of specific areas discussed in the text.



10.1 ATHENREE / KATIKATI

This area, which is adjacent to the northern part of Tauranga Harbour, has low Pleistocene marine terraces capped with tephra-derived soils. The main resources are derived from these soils, the Kaimai Ranges hinterland, the harbour and the ocean. The earliest settlement pattern comprised pa that utilised coastal cliff sites, and many undefended sites that seem no more than shell *midden* scatters located well away from the pa and the coast on the rolling inland hills. Fieldwork undertaken in the course of disturbance that was related to development has demonstrated that the middens are associated with infilled storage pits and garden soils (McFadgen 1982).

In the 1960s, a nationally important excavation of the Kauri Point Swamp was undertaken, in a small valley immediately adjacent to the pa of the same name (properly Owarau pa) (both site U13/4). The excavation revealed a small site with an estimated 13 000 obsidian flakes and up to 200 wooden combs, all broken (Shawcross 1977). There was a square of horizontal timbers, some of

which were reused house posts with tenon-jointed ends, and some related upright stakes. Floors of silt and organic material, some of which was wood chips, were present in and around this structure. The distribution of the combs and flakes centred on the structure but also extended beyond it. As well as flakes and combs, there were many other items, including figures, ko (digging sticks), weeding tools, wooden bowls, adze handles, wooden spear tips, broken musical instruments and fibre. However, the number of combs was quite disproportionate to the numbers of other organic items.

There was a considerable depth of material at the site and it is apparent that it had been used for the same disposal purpose for some period of time. Red ochre was common in the site, as were gourd fragments. The top of the site had dried and oxidised at some time in the past, with destruction of the uppermost wooden material (but not the obsidian). Consequently, the last use of the site was probably not represented in the organic material found.

The combs were small flat panels of wood with long carved teeth at the bottom (which would secure the comb to hair tied or bundled at the rear of the head) and exquisitely detailed figurative carvings at the top. They revealed use of manaia bird-like figures as decorative elements through the whole time depth of the site. The heads of the combs varied in form from rounded, through geometric to more realistic depictions of human heads. Shawcross (1977: 289) convincingly argued that all are derived from the depiction of a head incised or carved in a highly stylised form. There was a shift in style through the period of use. In the earliest deposits, a square-topped form was universal, with a gradual transition to a round-topped form, comparable to examples collected in the late 18th and early 19th centuries.

The obsidian flakes were derived from a simple industry, with no sophistication of stone working apparent. Some were found in 'wallets' of woven fibre. One group of 60 flakes was found in a gourd along with a small hammer stone. Other flakes were found in clusters, as if they had been discarded as a group within a now-vanished container.

Shawcross (1977) reviewed the ethnographic evidence and convincingly argued that the site was the disposal place of *tapu* (sacred) material that had been associated with the head (a tapu part of the body to Maori), combs, obsidian for hair cutting or possibly ritual scarification, ochre used in decoration of the hair or head, and wind musical instruments played from the lips (Shawcross 1977: 297–300). It would have been logical for the site to have also been used for disposal of cut hair, but no evidence of this survives. The combs may have been deliberately broken when their owners died or started to use a new comb. Whatever the reason for the damage, they were certainly rendered unusable. Shawcross argued that the material was thrown into the site so people could avoid personal contact with the material already there. Shawcross (1977) considered the site was used over several centuries, but Green (1978) argued for a shorter period of time.

Shawcross (1977) argued that this site was a wahi tapu (sacred place) based on ethnographic analogies. He was less convincing about it being a particular variety of wahi tapu—a wai tapu (sacred water place)—as water does not seem to have been essential to its function. The fact that it became a swamp may have been incidental to other Maori use of the small valley in which it lies.

This is an extraordinary site. Phillips et al. (2002) made the case that there is at least one other site where permanent interment of wooden objects was intended, but this is outside the Bay of Plenty region and is not a comb depository. Other wooden artefacts found in wetland sites were more commonly placed in these sites for temporary burial and intended recovery (see Phillips et al. 2002). The demonstration of stylistic change in a stratigraphic sequence is most unusual in New Zealand. The time range for use of manaia styles was an important discovery and a major contribution to the understanding of the history of Maori carving styles.

It must be asked why other similar sites have not been found. This may be because they have not been looked for, but such sites may not normally have been in swamps. If they were on dry land, only the ochre and the obsidian would have survived to the present day, and the site would now present as a place with a high density of these minerals. If such sites exist, they are at present absent from the archaeological record.

The site graphically displays the paucity of evidence that archaeologists deal with when they excavate normal (i.e. non-swamp) sites. The material from the adjacent cliff-edge pa is minuscule in its assemblage size and diversity in comparison. The excavation of the pa site was also a pioneer piece of excavation in New Zealand, with several seasons of work by Golson (1961a, b, c) and Ambrose (1962, 1967). The site presents today as a ring ditch pa and excavation has demonstrated that this was its form in much of the past as well, though a greater area had been enclosed at one intermediate phase. The exterior bank and ditch had been rebuilt in the course of the occupation.

The interior of the pa site was a mass of intercutting pits. The earliest evidence on the site was of pits capped by a garden soil that pre-dated the first fortification. The pits varied in size from 6 m long down to small 'bin' pits. Ambrose (1967) made the case, now generally accepted, that they were constructed for kumara storage, and had short lives before being infilled because of the risk of tuber-rotting fungus spores accumulating in them. He also suggested that fires were lit in the empty structures to fumigate them between uses.

Use of the site for gardening was followed by construction of terraces that were used for cooking and for storage pits. A shell midden is associated with this use. The first ditch defences enclosed the majority of the site and were contemporary with a late stage of the deposition of this midden. A double ditch was used on areas of lower relief, and a single ditch where it was steeper. The inner side of the earthwork defences was palisaded. The ditch was later filled with midden and then the site was re-fortified on a smaller perimeter with a recut single ditch. The last stage of defence following this was construction of a double ditch around the smaller perimeter site, with a palisade along the inner bank and in the base of the outer ditch. The outer ditch was V-bottomed, and the inner was flat-bottomed. Ambrose (1967), in noting the density of pits in the area where there was evidence of three phases of defence structures, concluded that the main purpose of the pa was defence of what was being stored in the pits. Ambrose also raised the expectation that the details of pits might be the 'pottery of New Zealand'—that is, they

would have distinctive forms in their post holes, drains and buttresses that varied spatially and temporally, and these particular features may be able to be used for sorting ages of New Zealand sites. This expectation has generally not been realised, as pits vary considerably within sites, meaning that large samples are needed to make comparisons. The effort required to empty large numbers of pits has defeated some field workers. It is now common practice to record plan size at the surface, or excavate cross sections rather than large parts of pits. No comprehensive history of styles has emerged.

Green (1978), in interpreting the dates from the swamp, the pa and the stratigraphic inter-linkages, argued for a 15th-century date for the first agricultural use of the site. By the end of the 15th century, the settlement of the headland resulted in the stream becoming ponded at its outlet and the swamp beginning to form, followed by the commencement of use of the swamp site. Green considered that the use of the swamp site and the first stage of occupation of the pa occurred in AD 1650–1700. The smaller defended pa was occupied later than this, but this occupancy did not extend into the 19th century, based on the absence of European-sourced materials amongst the excavated articles. This sequence, though very plausible, is based largely on dates from unidentified charcoal. Such dates are known to have potential inbuilt age errors and would not be considered for dating in modern archaeological practice. Therefore, the possibility of the occupation sequence being compressed into a more recent period must be considered.

The Kauri Point undefended site (U13/45) excavated by Green (1963b, 1964) contained a small area of midden and a number of pits of considerable variety in form. It was dated by a sample of unidentified charcoal to the late 14th to early 16th century, but inbuilt age exaggeration is possible. In any event, it is likely to overlap in time with the nearby Kauri Point site, indicating that different occupation styles occurred simultaneously in this area.

Two other Kauri Point sites have carbon dates recorded in the C14 database, but do not appear to have archaeological reports. These are U13/593 (a pit site) and U13/903 (a cultivated garden). The dates are both 16th to mid-17th century.

A further major pa excavation has been carried out at nearby Ongare Point (U13/8). This cliff-edge pa with ditch and bank defences in three defensive units is notable for a huge shell midden along its seaward side—so large that it has been mined for chicken grit. Shawcross (1964, 1966) concentrated on the interior areas, finding intense pit building, with intercutting pits. The structures could be sorted into seven stages, starting with cultivation of the site and some oven building, followed by four stages of pit building, the latest of which had near-contemporary garden soil creation. In the next stage, burials were undertaken on the site, and Shawcross (1966: 640) suggested that the area must have been otherwise unused at this time. Lastly, the site was reoccupied with large-scale preparation of shellfish. The defensive earthworks are associated with this stage; however, since Shawcross only sectioned an internal defence, it is possible there were earlier perimeter defences. Indeed, the intensity of the pit construction on a defensible site must make this likely. The site is undated. The lack of any European artefacts led Shawcross to conclude it is not the site of the 1842 raid of Taraia (see below), as had originally been hoped.

The Athenree area has also been the focus of some archaeological attention. On the outskirts of a pa at Roretana (U13/50), McFadgen (1982) identified two cultivated soils. One had articulated shell dug in, believed to be contemporary and dated to between the mid-16th century and the end of the 17th century. The second was overlain by a shell midden, and shells from this have been dated to between the mid-15th century and the mid-17th century. In the C14 date list, there is a record of a date on T13/31, which is described as from a midden above a cultivated soil; this dates to between the mid-16th and mid-17th centuries.

Anatere Pa (U13/46) has been the subject of a series of investigations in the face of progressive destruction. These have been summarised by Phillips & Allen (1996a, b). Although the site is a pa on a sea cliff margin with a flight of seven low internal terraces, the initial occupation, which has been dated to the early 16th century, was an undefended site. This was first used as a small terrace where gardening, pit storage and cooking took place, and fish and shellfish resources from the harbour and ocean were exploited. The major terraces and the fortifications were formed subsequently, dating to around the late 16th to early 17th centuries. The intercutting pits and other features demonstrate that the site was occupied for some time, and indicate three stages of construction. The authors suggested a 50-year duration of occupation. The defences were a ditch and bank, with two palisade lines on and inside the inner bank.

The terraces had different uses. One was largely used for storage structures, while others had a mixture of houses that were used for cooking as well as storage. The pits included larger rectangular pits, small bin pits and rua. Marine resources from varying localities were used.

A large amount of obsidian was obtained from the site, and it was determined that this primarily came from two local sources—Waihi and Mayor Island (Tuhua). The proportions of each type of obsidian varied between locations in the site, but there was no clear pattern over time.

The site was apparently disused until it became farmland. Three other pa at Athenree were sampled for carbon dating by McFadgen (1982). In each case, the dated material was obtained from below banks of ditch and bank defences. All three samples had similar ages, from the early 16th to the end of the 17th centuries, dating the period of occupation to before the defences were built.

The picture from the Katikati/Athenree area is one of use of both the marine resources of the harbour and the horticultural products of the soils of the area for sustenance, starting from the 15th century. There is direct evidence of gardening, with cultivated soils identified and dated, and supporting evidence provided by storage pits. Undefended occupation spread over the entire lowland area. This preceded fortification on several coastal sites that were well suited to fortification. Fortification appears to have begun in the early 16th century and is concentrated on coastal cliff sites where there was some natural defence. Ditch and bank defence dominated from the earliest stages of construction. The interior of pa were often intensively used for pit storage, showing the importance of securing food supplies during times of stress. Occupation in this area spanned the period of development of

the later styles of combs from the Kauri Point site, and included the use of mania decorative elements in carved objects. There was then cultural change following the commencement of this pattern of use. However, the basic settlement pattern and economic base appears to have been stable over this period. From a wider environmental perspective, it seems likely that there was widespread destruction of coastal forest and an early retreat of the bush-line to the foot of the Kaimai Ranges, leaving a climatically benign coastal zone with widespread fern and, at best, only regenerating forest.

10.2 RU AHIHI

While there has not been as much archaeological work in this area as at Katikati, Ruahihi Pa (U14/38) (McFadgen & Sheppard 1984) is important in showing how a site and its local area that was well inland from Tauranga Harbour was occupied and used. The site name derives from the area rather than being a traditional name for the pa itself. Although inland, it was within the navigable limit of an adjacent river, so access to Tauranga Harbour was available. The site had a long sequence of occupation and because it was never very intensively used, many features have survived better than in many of the coastal pa.

The site had an inner defended area on a promontory and an outer area, some of which was within a further ditch and bank-defended area. The site was covered in a garden soil that pre-dated the fortification bank. Gardening continued on the site after fortification. Most of the rua, pits and houses found overlay or were cut through the garden soil. The sequence of fortification development began with a palisade line in the outer area. This was later cut by a ditch and bank. On excavation, no palisade was detected within this defence, but as the bank had been lowered by bulldozing, the evidence may have been lost. The inner defended area may be contemporary with either of these fortifications, but there was some prior occupation of this area before its fortification. Law (1984) also commented on the history of this site.

The inner trench was later partially infilled deliberately, but most of it infilled naturally during the occupation of the outer area. Features associated with this occupation included cooking areas, which were separate from areas with rectangular pits. The pits had been infilled after use. In contrast, rua had not been deliberately infilled. Several shell middens were also present. Unusual finds were a burnt fishing net and two fishing sinkers, which indicated that marine resources from the harbour were important to the inhabitants of the pa. Several house plans were uncovered, some with cache pits within them. Carbonised remains of the roof structure were found in some of the house sites, with fire-reddened earth lying over them. The authors believe that these houses had earth covers on their roofs (McFadgen & Sheppard 1984: 39).

The occupation sequence commenced close to the end of the 16th century and continued into the historic period, demonstrated by the fact that iron fragments were found in two of the houses. Immediately outside the inner defences of the promontory, fortifications do not seem to have been present for most of the period of occupation of the area. This outer area was used

for gardening and living. Pits appear to be absent from the middle part of the sequence, but McFadgen & Sheppard (1984) noted that this may be because they were located in an unexcavated part of the site.

Pollen and land snail remains indicate that the site had forest or forest scrub vegetation when first occupied, with bracken fern becoming dominant by the 18th century. Seeds of several different food plants were recovered in the excavation, including rimu (*Dacrydium cupressinum*), hinau (*Elaeocarpus dentatus*), matai (*Prumnopitys taxifolia*) and tawa (*Beilschmiedia tawa*), but not karaka. Some of the rua had layers of charcoal in their bases from the burning of bracken, grass and manuka. McFadgen & Sheppard (1984) made a case for the rua being used for smoke preservation of edible fruits.

Ruahihi Pa is a very important site in terms of the range of evidence preserved, particularly relating to plant use. The site demonstrates that pa often have a history other than that directly related to defences. The long-term reuse of the area for gardening, storage and occupation, and its continued connection with marine resource use indicate a well-defined and settled pattern of use of the inland area that was associated with use of outlying areas and the harbour. The attraction of the site for occupation probably related to the combination of access to forest resources, access to the sea via the adjacent river and the security provided by the readily defensible promontory.

10.3 MATAKANA ISLAND

On its Tauranga Harbour side, Matakana Island is composed of consolidated Pleistocene sand dunes. This area has many pa sites (McFadgen & Walton 1981). The remaining seaward part of the island is more recent and composed of accumulated sand. A research project led by Prof. D. Sutton (University of Auckland) has investigated both parts of the island, but with a particular focus on the more recent sand part (Marshall et al. 1993a, b; 1994a, b). This area has a very high density of midden sites. Carbon dating of charcoal preserved in the sand has demonstrated that this part of the island was once under mature forest, including kauri in the northern part. A substantial amount of Kaharoa ash fell on the area. At some time after the deposition of this tephra, the area was deforested, probably as a result of clearing by Maori. Unlike other coastal dune areas that have been deforested in the last 1000 years, the sand in this area has not remobilised, other than in a few localised areas (Shepherd et al. 1997). Apparently, replacement of forest by scrub vegetation and fern, as revealed by the charcoal identifications from the middens (Wallace 1999), was sufficient to protect land surfaces and prevent sand remobilisation. However, the picture is somewhat confused by the continued presence of forest timber in archaeological samples. Wallace (1999) made the case for this being the result of ongoing use of wood from stumps left from the earlier forest.

The sites investigated by the Sutton-led team on the sand part of the island turned out to be more than simple middens. While none of the sites were investigated using area excavation over large areas, vertical profiles indicated that many of the middens were deposited over cultivated soil and that

gardening had continued at many of the sites after the deposition of the midden (Marshall et al. 1993a). In these sites, the Kaharoa ash was rarely found intact; rather, it had been mechanically disturbed (as it is generally elsewhere on Matakana Island) (Froggatt 1994). In a few places, midden material has been placed directly over intact Kaharoa tephra, but has never been found beneath it. Other middens appear in soil profiles in positions that indicate much more recent deposition. Middens on the dunes and dune ridges were found to be larger and more varied in composition than those in low-lying areas. These may indicate preferred occupation sites and the longevity of occupation. Pits were found at some of the sites investigated and two sites that only had pits were found in excavations where there was no previous surface indication of pits (Marshall et al. 1994a, b). Some of the middens included fish bone (see Appendix 4 and Leach et al. 1994).

Marshall et al. (1994a: 23) described the period of human occupation of Matakana Island as having a devastating effect on the land. However, this description must be tempered in comparison with other North Island coastal land where sand remobilisation following vegetation clearance really was hugely damaging to the local coastal environment, such as the land behind Ninety Mile Beach on the west coast of Northland (Coster 1989: 70). Marshall believed that pit and terrace sites may well turn out to be common in the sand area of Matakana Island, but noted that they are difficult to identify from surface features.

These studies have revealed an unexpected archaeological landscape. It would appear that the combination of the forest soils and the Kaharoa ash provided an environment favourable to Maori gardening, which seems to have been taken up over the greater part of the area, although bracken fern root harvesting and later kauri gum digging cannot be excluded as a source of some of the soil disturbance. A variety of obsidian hydration dates have been obtained for obsidian samples obtained from middens, falling between late 17th and early 19th centuries, although there is some error associated with these dates.

A pa site, Ureturituri (U14/187), on the harbour side of the island, was also investigated during Sutton's research programme. It is a ditch and bank-defended, cliff-edge pa, very much in the style of those of the Athenree/Katikati area. A geophysical survey (Ladefoged et al. 1995) identified what appears to be an inner defensive trench on the site, now infilled, but this has not been tested on the ground. Rather, sections of the standing ditch and bank and a separate area within the apparent inner defence area have been excavated.

The bank section indicated four phases of occupation, starting with a thin layer of charcoal and burnt shell, through which the ditch was cut. A period of erosion followed, then the site was reoccupied, with construction of two pits followed by their infilling, in part by widening of the bank (Anon. 1993). Finally, some terraces were cut into the bank. There is a charcoal carbon date from beneath the bank, which dates its construction to some time between the mid-16th century and the early 19th century.

Marshall et al. (1994b) considered the inner, non-investigated ditch to be the older line of defence, presumably on the grounds that its infilling allowed

use of more interior space inside a later and larger defence perimeter. This explanation is not unassailable, as it may have been one of two concurrent lines of defence that later occupiers decided to dispense with.

The inner area excavation (Petchey 1993b) revealed a complicated sequence. The earliest use involved construction of large rectangular pits and *rua* of the form excavated in the sides of pits. There then appears to have been a hiatus, followed by construction of a slight surface structure containing a cooking-fire scoop. This was followed by a series of medium-sized rectangular pits, again with associated *rua*, and a rectangular surface structure. More rectangular surface structures with associated fire scoops followed. After this were some small pits and then a further surface structure. The surface structures left rectangular dark patches with post holes that can be related to them. These were most likely house sites. Most recently, the area had been cultivated using a single-tine plough.

Obsidian hydration ages on material from this area vary from 170 to 320 years BP (i.e. from late 17th century to early 19th century) (Jones 1994). The relationship of these ages to the excavated sequence of structures has not been published.

Petchey (1993b) aligned the sequence at the bank excavation with the earlier part of the inner area sequence, which is contrary to the interpretation by Marshall et al. (1994b) that the excavated bank was part of a later defence of the site. The dating evidence can be interpreted either way.

Midden material was available from much of the sequence through the inner area (Pepa 1993), though the individual numbers of particular shellfish in the samples were often small. All of the samples had a diversity of shellfish species, with ocean beach and harbour species mixed together. The proportions of particular species in samples and the sizes of the common species did not show any patterns or changes over time. This suggests a fairly steady state of use of the shellfish resource.

Although these various studies at Matakana are mostly in preliminary working paper form, they are still valuable. They reveal a surprisingly extensive use of the recently stabilised sand dune area. The sand area was used for more than just the occasional consumption of shellfish. It also seems to have been used extensively for gardening and associated uses, including the construction of storage structures. Occupation of the excavated *pa* appears to have been contemporary with use of the sand area. The form of the *pa* and their intense history of use is similar to that of the *pa* reviewed in the Katikati/Athenree areas. The *pa* in the two areas were of the same age. What distinguishes the Matakana area is that occupation of the island cut off the residents from ready access to the remaining forest resources along the Kaimai Ranges, so they would have had to bring in even such basic resources as oven stones. The advantages bestowed by the soils and the good marine access must have overcome this, as site density in the sand area is no less than it is on the inner side of the harbour.

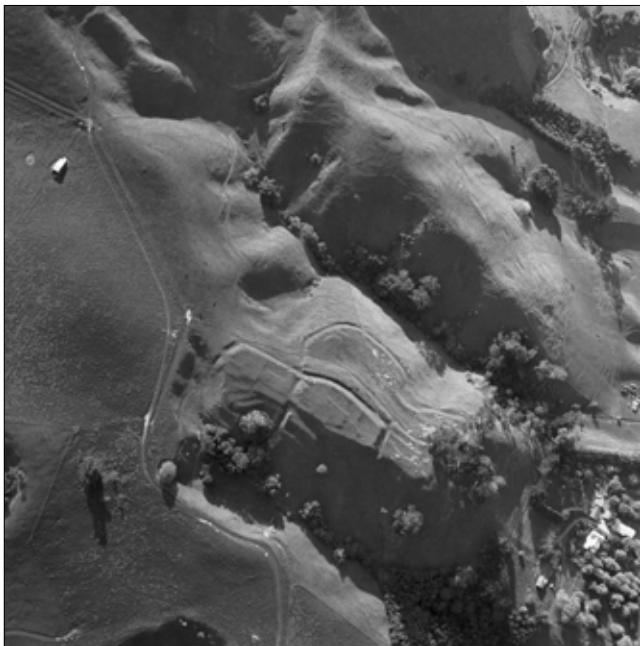


Figure 15. Pa on Papamoa Hills, oblique aerial photo.
Photo: K. Jones, DOC.

Papamoa is a spectacular archaeological landscape (Fig. 15). The most striking features are the pa sites on the hills behind the coastal plain (Tapsell 2002). These have attracted archaeological interest over a long period (e.g. Blake-Palmer 1947: 237). The hills are steep and of mixed sedimentary and volcanic origin, with one pa (Wharo) built around a volcanic rim. The pa are associated with many terrace sites and a few sites that comprise pits only (Fig. 16). On the coastal plain is another landscape, which, if visually less spectacular, still holds considerable interest. Over recent years, the coastal plain area has received a lot more archaeological attention than the hills, as it has been developed for housing. The area undergoing modern development consists of a 20-km coastal strip with unconsolidated dunes post-dating the Taupo eruption, which extend up to 400 m inland. The dunes represent recent (post-Taupo) sand accumulation. It is presently

unknown what initiated the formation of these dunes. Inland from the 400-m-wide strip of unconsolidated dunes is a zone of regular, smooth-shaped dunes that have wetter zones in their swales. To the east, these adjoin an area of meandering channels of the Kaituna River (Gumbley & Phillips 2000). Relatively few middens have been recorded in the most recent dune zone. The inland dune zone is much richer in sites. Three swamp pa are known from this zone. Although none of these have been investigated so far, they are potentially very important. To the east, on the coast, is the historically important site of Te Tumu (V14/40). Pa with known historic associations are present along the Kaituna river channels, but have not been subject to archaeological investigation. They have the potential for wet deposits and, thus, good wood preservation. The majority of sites are recorded as middens, but the range of evidence recorded on the now frequent mitigation excavations in this zone is somewhat wider than just middens. Hangi and scoop hearths are frequently associated with the middens, and storage pits of moderate size are apparent at others. There is also some evidence for living floors and surface structures.

The volcanic ash-based soils on the inland dunes have frequently been disturbed. The dune ridges were forested prior to the Kaharoa ash fall. Evidence from pollen indicates that the forest was cleared immediately after the ash fall. The soil disturbance has been interpreted as resulting from cultivation (Gumbley 1997); but, as noted above for Matakana Island, once a fernland was established, soil disturbance could also have resulted from fern root digging.

The individual sites recorded so far at Papamoa will not be reviewed here. They are covered in other reports (Hooker n.d., 2001; Gumbley 1997, 2004; Bowers & Phillips 1998; Wallace 1999; Gumbley & Phillips 2000, 2004; see also the excavated sites listed in Appendix 2). They are commonly midden scatters with closely associated scoop hearths and ovenstone clusters, and occasional post holes.

The coastal plain sites are striking for the relative paucity of artefacts and the rarity of fish bone. Shellfish from ocean and harbour shores are present,

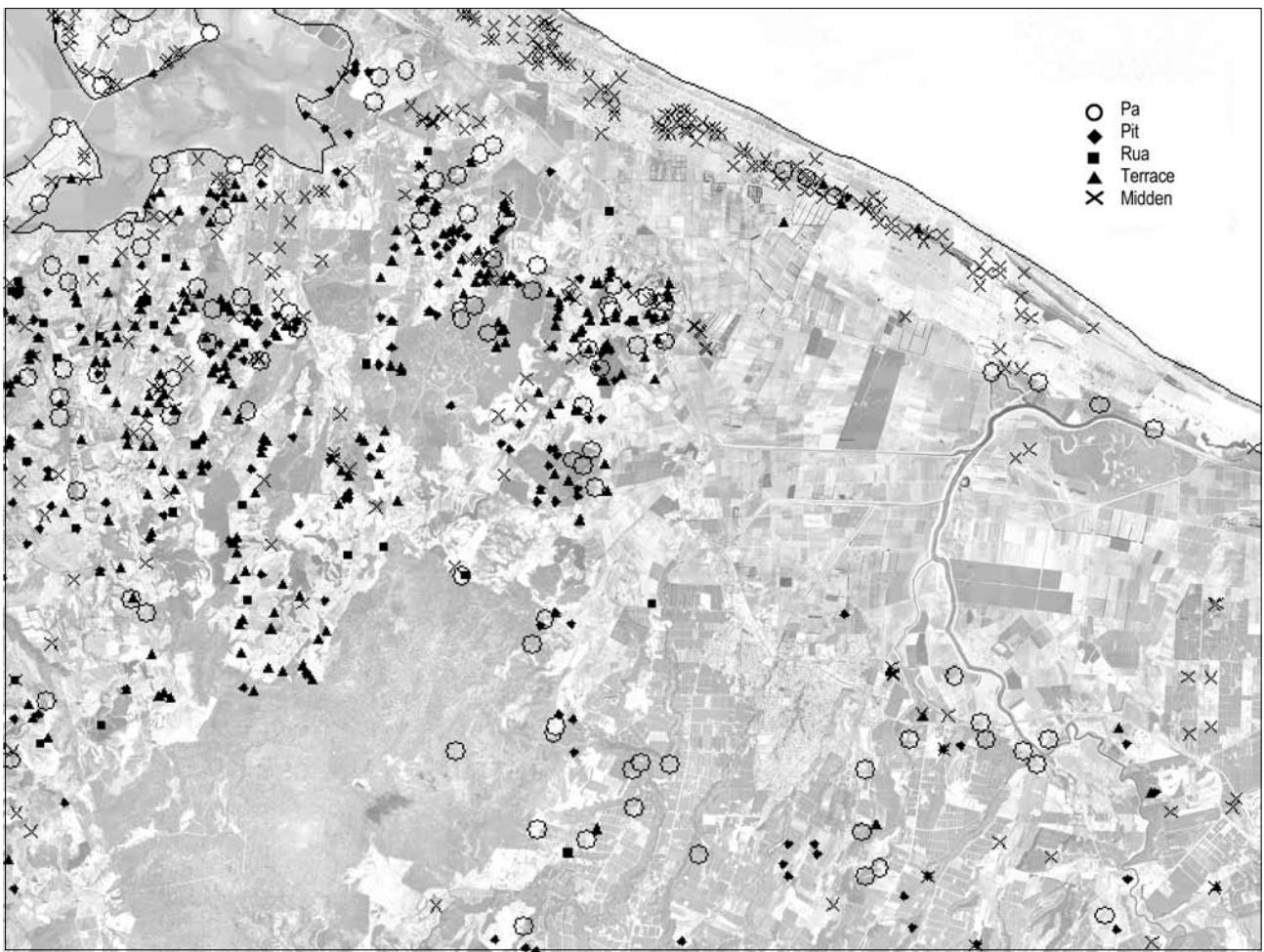


Figure 16. Site distribution at Papamoa, Bay of Plenty. The site type hierarchy is pa > pit/pits > rua > terrace/terraces/platform > midden. Sites with more than one form of evidence in their type classification are classified in the highest category, i.e. a terrace/pit site is classified here as a pit site. Pa are concentrated on the Papamoa hills but also along the harbour edge, and there are a few on the older coastal dunes. Pits, rua and terraces have upland sitings. Middens are concentrated behind the youngest dunes on the coast, but some have upland sitings.

some of which would have had to be brought some distance to be consumed at these sites. Clearly, there was some economic purpose to the location of the coastal plain sites. Plant identifications from charcoal are available for many of the sites. While many samples are derived from scrub and fern, charcoal from forest trees has also been identified, probably resulting from the use of stumps and relict wood (Wallace 1999), as at Matakana. Hence, the charcoal identifications are not as useful in indicating the progressive clearance of the former forest as might have been hoped.

There is now a large number of radiocarbon dates on shell from these sites (Appendix 3). They indicate that occupation of the area had certainly started by the early 15th century and that it continued into the 17th century. Dates from the 18th century are noticeably absent. As Gumbley & Phillips (2000) noted, the relationship of the coastal plain sites to the other sites on the hills behind is not clear.

Two pa on the hills above Papamoa have had archaeological excavation. Tamapahore Pa (U14/209) was investigated on a mitigation basis by Caroline Phillips (1999a, b). Because she was working in areas that had been damaged, the data recovered were necessarily limited. The site is a hill pa with scarp defences. There are large storage pits on the upper levels. The damage exposed a section through a lower terrace, which had been used for cooking

and storage pits. The shells in the midden were from both harbour and coastal environments. One terrace showed two stages of occupation, with the earlier firmly dated to the 18th century. This may not, however, date the use of the higher part of the site, which may have been occupied earlier. The second pa is unnamed (U14/243) (Anon. 1985: 139; O'Keeffe 1991: 18). At this site, part of a terrace was excavated. Midden material was found, along with evidence of cooking, post holes, storage pits and rua, as well as an infilled defensive ditch underlying the terrace. The lower part of the site (at least) had undergone a major re-shaping, extending the area available for use. This site has a date from fill in a defensive ditch (see Appendix 3), but the published information does not make it clear if this was from under the terrace. In any event, it is not very helpful, as the age range obtained was late 16th century to early 19th century. A second date from fill within a rua at the same site was also between the late 16th century and the early 19th century.

An undefended site on the hills behind Papamoa (U14/1675) has also been investigated in a mitigation excavation. The site consists of a *platform* and a lower terrace (Bowers & Phillips 1998). While much of the surface of the site had been removed prior to its investigation, some useful information remained. Rectangular pits were present on both the terrace and the platform. These were clustered in each location. Separate from the pit areas on both, were areas with postholes. The terrace had an area with burnt soil and a separate area with midden material, and the platform had a similar area of burnt soil. Hearths were found scattered on the platform, but away from the area with post holes. While houses were not clearly indicated, it is likely that the site shows spatial patterning consistent with the separation of storage, houses and cooking. A late use of the terrace was for some unusual shallow circular pits. The site is not dated, but is close to the pa U14/166, which has been dated (see below). Since undefended sites seem to be satellites of defended sites in this locality, the date for the pa may be relevant. The investigation showed that undefended sites have the potential to be of more limited time depth than is often found with pa and able to reveal social space use far more readily than sites that have been more intensively reoccupied.

In the C14 date list (Appendix 3), there is a series of dates from Papamoa pa collected by McFadgen (not including Tamapahore). These were from shell samples taken from existing exposures. No publication of the details of the locations or any interpretation of them has followed. However, at the very least they indicate occupation of the sites at the dates determined. Occupation of these localities on an unfortified basis is possible, but given their elevated and defensible locations, it is likely that most occupation dates relate to fortified use of the sites. The earliest dates place occupation of U14/207 between the mid-15th century and the early 17th century. The latest dates place occupation of U14/432 in the 18th century or later. Four other sites (U14/125, 298, 238 and 242) have dates intermediate between these. The dates cannot be considered as a single group statistically, so real-time depth is indicated, demonstrating that the sites were occupied from at least the 16th century.

One other pa site at Papamoa (U14/166) has been dated. This site has a date on a single sample from fill below a terrace, which gives a date between the mid-17th century and the end of the 18th century.

On this limited evidence, occupation of the hillside pa seems to have started a century later than the sites on the plain, but then persisted into the

18th century, at which time the plain seems to have been unused other than for the deposition of shellfish midden. This interpretation could well be negated by more detailed work on both the upland and plains sites. This landscape of hills and plains, with the latter possibly having rich wetland sites, is a tempting prospect for future archaeology in the Bay of Plenty.

10.5 KOHIKA

Kohika (V15/80) is a swamp pa near the Tarawera River and on its flood plain. It is set back from the coast, centred on a remnant of the sand ridge left by an earlier coastline. The central sand mound has been added to by imported material along its periphery. The site was palisaded and clear evidence exists that water lapped against at least part of its periphery. The present-day site is near to a small lake, and the site may well have been completely surrounded by water when it was occupied.

Excavation revealed that the site had been occupied for some period of time, with three succeeding house floor levels in the built-up part. The site was used for a period around the late 17th century. The site may have been used for as long as 180 years, but more likely for 40-80 years, based on a sophisticated analysis of the carbon dates (Irwin & Jones 2004). Use of the site seems to have ceased following a massive flood that infilled the lake at the periphery of the site, possibly rendering it too accessible and reducing security and/or lessening access to resources by canoe. Some burials were made in the site after discontinuation of residential use.

The interior of the site area is differentiated with respect to function. The higher and drier part has been used primarily for storage pits for crops that must have been grown elsewhere. Other parts of the site were used for pole and thatch houses and cooking. From the evidence of timber parts found at the site, there were also *pataka* and carved superior occupation houses (Wallace & Irwin 1999). Enough parts of the latter were found to convincingly reconstruct technological details and the form of the house or houses represented. From these, Wallace & Irwin (1999) hypothesised that house construction in New Zealand had close affinity with canoe construction, using similar types of lashing and joint detailing.

In the wetter parts of the site, a wealth of wood and other organic material was recovered (Wallace & Irwin 2004), as well as the *pataka* and superior house parts. Wood survives in swamps because the ground water has no dissolved oxygen below a certain depth and thus cannot support the bacteria that would normally attack the wood. The wooden material found at this site included bird spears (a bone point was also found), ko (digging stick), a ko footrest, a spade, weeding sticks, detachable spade blades, fernroot beaters, bowls, paddles, a steering paddle, canoe hull parts and fittings, net gages, tops, adze and chisel handles, fibre-working tools, a ladder, wedges, lashing vines, and javelins. No short or long clubs were found. The javelins are the only potential weapons in the assemblage. Interestingly, six combs of the round-topped form were also found. These were the later form identified from the Kauri Point Swamp site. None were broken through the frame, so the reason for their deposition here would seem to differ from that at Kauri Point. The site dating for Kohika (i.e. extending into the 17th century) is consistent with Green's (1978) dating of the Kauri Point depository.

Several wooden pieces from the site (including house posts) were carved. On the basis of the style of the carving, Wallace et al. (2004) considered that four different carvers were involved in the decoration of these pieces. Gourd rind fragments also occur in the deposits, some formed into open containers with notched rims and one with an incised decoration (Irwin et al. 2007).

A wide variety of fish and bird bone was obtained from the site (Irwin et al. 2004; Appendix 4). While the amount of bone material was not large, it was very diverse. Whale bones present were fresh and had been dog-gnawed. Seal and dog bones had been used industrially to make tools, and dogs also appear to have been eaten. There were also human bones present that had received some industrial use. The bird species recorded were from ocean, coastal, wetland and forest environments. Bone hooks and nets were present among the artefacts, and it appears that fish were caught using a variety of techniques. The fish were mostly estuarine, but some must have been caught in the ocean. Shellfish also had a diversity of sources. Some of the gourd fragments were from immature fruits, which appear to be food remains (Irwin et al. 2007: 44).

Obsidian was common at the site. Moore (2004) identified the majority of pieces as coming from Mayor Island (Tuhua), but some were from Taupo and the Maketu pebble source. Holdaway (2004) looked at the form of the obsidian flakes, and found that the presence of utilised flakes and waste material varied over the site. There was little evidence of production of any formal obsidian tool types at Kohika. The occupants frequently discarded large flakes, which suggests that the material was not highly valued and could be easily replaced. It seems likely that the occupants had good access to the Mayor Island (Tuhua) source of obsidian, either by exchange or direct collection.

Other artefacts recovered from the site include a bone tiki, cordage, woven matting, two nephrite adzes, a nephrite chisel and two nephrite pendants, a drilled human tooth, a bone toggle, fishing gear, needles, a bone awl, a bone chisel, pumice containers, and a pumice kumara god.

The distribution of sites in the Kohika area makes it likely that the occupants were contemporaries of people who used pa and pit and terrace sites on the higher ground around the plains. The ash-covered sand ridges closer to the coast were gardened and used for cooking and storage (Jones 1991). Interestingly, there were hardly any gourd seeds at Kohika, suggesting that these plants were grown and processed elsewhere. Remote gardens would be a satisfying complement to the Kohika site. Jones (1991) dated an intermediate stage of the nearby Thornton site on the dunes (W15/121) as mid-17th century or later. On this basis, it is not possible to say that the two sites were definitely contemporary, but it is a possibility. The tight dating of Kohika adds to its value, as it can be used to compare and contrast with other sites.

Kohika is a key site in the archaeological definition of the culture of pre-European Maori living in the Bay of Plenty. Its residents had good access to a wide variety of environments, particularly using canoes. They exploited the freshwater, coastal and offshore marine environments, and grew their crops on what drier land they could reach, bringing at least some of them back to the site. The people had time to decorate their houses and indulge in other crafts and games. The differing house forms represented in recovered artefacts suggest there was status differentiation among the inhabitants. They may have lived in a period of low stress with their neighbours, as their site is not strongly defended. They had access to resources as distant as Taupo and Mayor Island obsidian, and South Island nephrite.

11. Historical archaeology

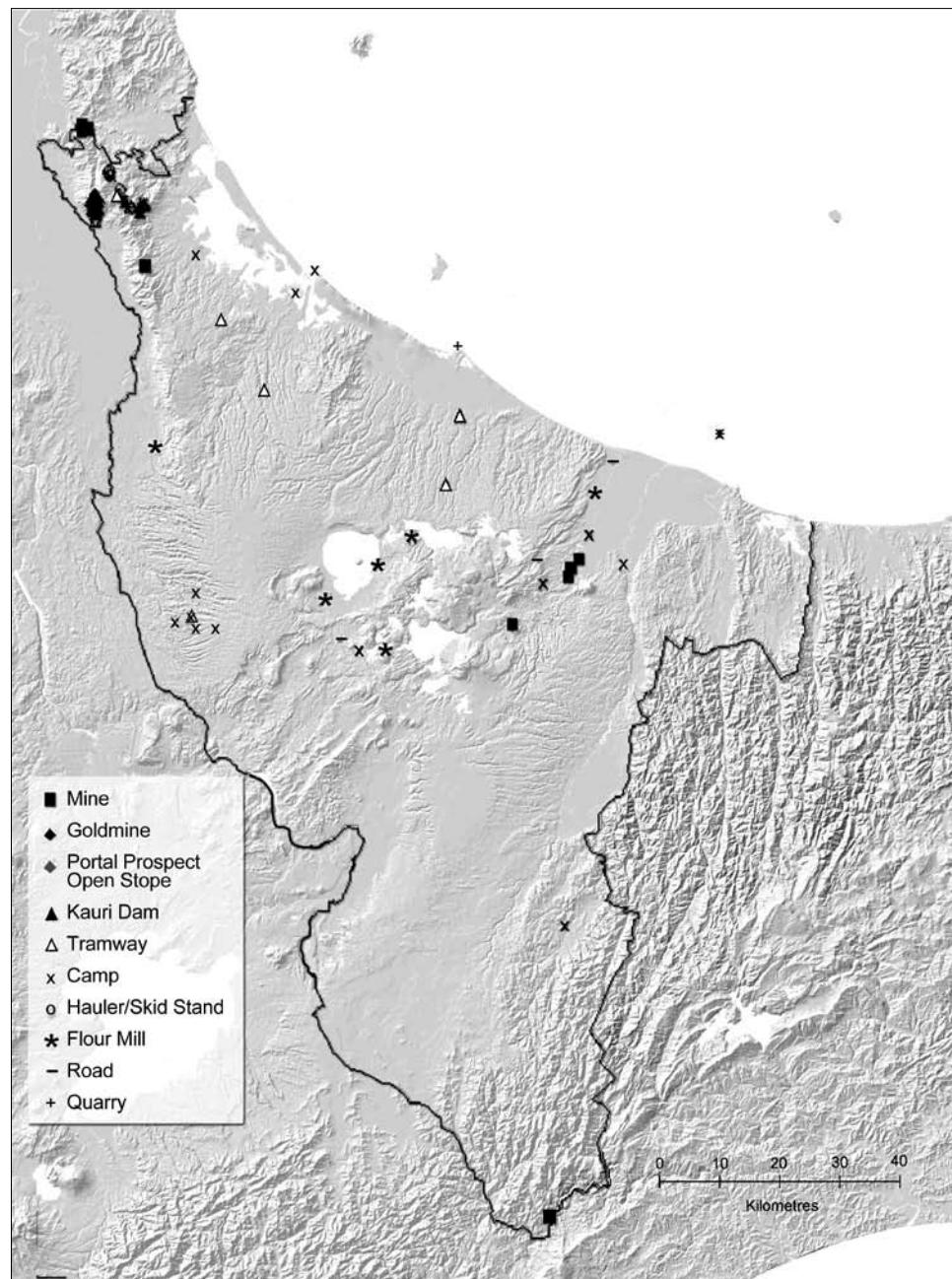
Historical archaeology has received little attention in the Bay of Plenty, much less than its potential deserves. This section will, of necessity, be a sketch of the potential for further work in some particular study areas, and will spend as much time on significant but little-recorded or studied aspects as on those that have already received some attention. There is a substantial resource in local histories from the area, but relatively little of the work of local historians has connected the matters covered to existing archaeological evidence. The lack of attention to historical archaeology can most convincingly be attributed to the relative recency of the modern development of the Bay of Plenty. A secondary but related factor is the AD 1900 cut-off date for the legal protection of sites in the Historic Places legislation, which must limit the attention historical archaeology gets in resource management related to development.

Mining and timber working dominates the listed site types in the Site Recording Scheme for the region (Table 4). The number of some types of sites, such as flax mills, must be much less than the number of sites that could be recorded. Figure 17 shows the distribution of non-Maori sites in the region. The recording is so patchy that it is hard to conclude much from the distribution. Indigenous forest extraction sites (such as mills or *snigging tracks*) will be much more extensive than the pattern revealed in the areas currently surveyed.

TABLE 4. NON-MAORI SITE TYPES IN THE BAY OF PLENTY FROM SITE RECORDING SCHEME.

SITE TYPE	NUMBER	SITE TYPE	NUMBER
Mining		Transport	
Mine or gold mining	6	Bridge	2
Prospect trench	7	Tunnel	4
Portal	83	Road	18
Open stope	5	Track	12
Chute	3	Occupation sites	
Water race	7	Hut	10
Battery	6	House / dwelling	6
Tailings site	1	Hotel	1
Timber		Town	1
Kauri dam	6	Camp site	5
Tramway	25	Mission	2
Logging camp	7	Redoubt	8
Hauler/skid stand	3	Armed Constabulary fort	2
Tram tunnel	1		
Other industry			
Flour mill	6		
Flax mill	1		
Dam	3		
Quarry	6		

Figure 17. Distribution of some non-Maori site types in the Bay of Plenty region.



11.1 CONTACT PERIOD

By the early 19th century, exploration, trade and religion brought Maori and Pakeha into regular contact in some parts of New Zealand. These activities developed somewhat later in much of the Bay of Plenty area. Seals and whales were not as significant a resource in the area as they were elsewhere in New Zealand. Although there was some shore whaling in the eastern Bay (Prickett 2002), there is only a single reference to it further west—a whaling station run by Gilbert Mair on Moutohora (Cowan 1935: 133), which has not been located archaeologically. The absence of readily available timber around Tauranga meant it was excluded from that trade, and elsewhere in the region the absence of harbours or navigable rivers limited access where timber was present (Stokes 1980).

The pressure Maori felt to acquire muskets to redress the military imbalance created by other iwi who had greater trade opportunities, was an important factor in the opening up of the Bay of Plenty to trade. Of the classic products of Maori trade—labour, pigs, potatoes, flax and timber—timber and labour for timber extraction were both constrained in the Bay of Plenty area by the limited availability of trees close to the harbours. Pigs (*Sus scrofa*), flax and potatoes were the earliest commodities traded from the early 1830s; and wheat (*Triticum* spp.) was traded once the Auckland market became established in the 1840s. Inland iwi were particularly constrained, and their access problems sometimes led to specific interactions and alliances between iwi. For example, Ngati Haua in the inland Hauraki area were prevented from trading on the Hauraki Gulf coast due to tribal enmities. They overcame this disadvantage by building their alliance with the tribes of Tauranga Harbour. Te Arawa at Rotorua were mostly remote from the coast, and they gained access by defending the extension of their territory to the coast at Maketu (see below). However, it was not practical to transport potatoes or flax from these areas to the coast. Pigs were the most transportable commodity. They were driven over the Kaimai Range to Tauranga for trade. Rather than taking flax to the coast, the inland people went to the coastal flax resources. When Tapsell opened trading at Maketu in about 1830, some traditional enmities seem to have been put aside and a rush to produce flax and other products temporarily brought several different tribal groups to the area (Ballara 2003). Tapsell initially acted as an agent for other European traders. He came to the Bay of Plenty from the Bay of Islands with Ngapuhi associates and some women taken as slaves from Rotorua in the 1823 Ngapuhi attack there. While Maketu was initially recognised by Tapsell as Ngaiterangi (of Tauranga) territory, the Arawa connection led to a strong linkage with Arawa and resulted in them occupying and fiercely defending their Maketu territory against rivals from Tauranga. Warfare between Arawa and the allied Tainui/Tauranga tribes may have other historical causes, but rivalry over the access to trade kept it alive in the 1830s and '40s. Tapsell subsequently traded on his own behalf and had agents at Tauranga and Whakatane where he later settled. Other traders established at Tauranga and at Matata from the early 1830s. Small craft were used for some trade, without shore stations. Some early traders were based in the Bay of Islands.

Anglican missionary efforts began with an overland visit by Samuel Marsden to Katikati in 1820. This brought the population of the area to the attention of the Bay of Islands-based missionaries. Henry Williams first visited Tauranga in 1826 in the new mission schooner *Herald*. He revisited Tauranga and also Maketu and Whakatane on many occasions. The Matamata mission, established in 1833, was the first in the area; Te Papa at Tauranga was established by William Wade in 1835. Both missions were abandoned during the course of the intertribal war scares of 1836. Te Papa was then re-established by James Stack in 1837. Alfred Nesbit Brown joined it in the following year and became the long-term missioner there; he travelled extensively throughout the Bay of Plenty and the Ureweras.

Anglican Thomas Chapman visited the Rotorua area in 1831 and returned in 1835 to found a Mission, initially at Te Kuotu and later at Mokoia. After a period of abandonment through war, his missions restarted in 1838 and he

moved to Te Ngae in 1840. Seymour Spencer relieved Chapman there for a period and established a mission at Tarawera in 1845.

Catholic missionaries also operated in the area: Philippe Viard at Tauranga from 1840, Father Bojorn at Maketu from 1841, and Father Reigner at Rotorua from early 1843. Despite a later start, the Catholics had greater success in baptisms and confirmations than the Anglican Church Missionary Society.

Land alienation commenced with churches purchasing properties for their missions, but this never developed in the Bay of Plenty to the extent it did elsewhere, where missionaries sought to establish their descendants on farms.

11.2 THE ‘MUSKET WARS’

During the early contact period, there was much fighting between Maori in the Bay of Plenty area (Wilson 1906; Stafford 1986, 2007). This was not covered above (section 11.1) because it was not directly related to contact with Europeans. Ngapuhi were a principal belligerent from outside the region. They had an initial cause for war because a niece of a Bay of Islands chief—Te Morenga—had been carried off on the vessel *Venus* in 1806 and left at Motiti in the Bay of Plenty, where she was subsequently killed. Missionaries resided in the Bay of Islands (where the Ngapuhi expeditions originated) from 1814, so there is an accurate record of the dates of their expeditions from that source. Ngapuhi, led by Te Morenga, attacked Tauranga in 1818 then moved on to Whakatane. At that time, they had a monopoly on guns, which made them invincible in both places. Simultaneously, another Ngapuhi *taua* (war party) under Hongi Hika attacked Maketu, taking a pa there. Te Morenga again attacked Tauranga in 1820, defeating Ngaiterangi at Mt Maunganui, with large loss of life for the local side. Thereafter, peace was made, which lasted a decade.

Ngapuhi under Hongi attacked Rotorua in 1823 in the well-known event where canoes travelled up the Pongakawa River and were then dragged over portages to successfully attack Mokoia Island (Stafford 2007). Part of the party under Pomare and Te Wera then attacked Whakatane, taking a Ngati Awa pa there. The Mokoia battle avenged an earlier slight on Ngapuhi and, remarkably, an enduring peace was made immediately (Urlich-Cloher 2003: 178). The defenders of Mokoia had only one musket against the many arming the attackers (Stafford 1962: 18). This typifies the power imbalance that had resulted from the early trading advantages enjoyed by other iwi.

Ngati Maru made attacks on Tauranga, taking the pa at Te Papa in 1828. A Ngapuhi *taua* attacked Maungatapu pa at Tauranga in 1830, but was rebuffed. Later that year, a *taua* under Te Haramiti of Ngati Kuri surprised the residents of Mayor Island (Tuhua), killing many; but they were, in turn, surprised at Motiti, and only two of their group escaped capture or death.

In 1832, Bay of Islands chief Titore led a *taua* that attacked Otumoetai (U14/202) to avenge the last two losses. By now, no side had an advantage in musket fire power and Ngaiterangi defenders even had cannons. A stalemate resulted. The trader Tapsell supplied Ngapuhi in the fight, earning the enmity

of Ngaiterangi. This stalemated fight indicated that the musket arms race had come to an end, also marking the end of the mass slaughters that had been typical of earlier battles in the Musket Wars.

Titore raided Tauranga again in 1833, with unsuccessful attacks on Otumoetai and Maungatapu (U14/175). Arawa hapu fought on both sides in this conflict. Shortly after these attacks, the Te Arawa and Ngapuhi alliance strengthened and defeated Ngaiterangi at Te Tumu pa (V14/40).

Ngati Haua under Te Waharoa allied with Ngaiterangi to successfully attack Maketu in 1836. Te Arawa avenged this attack the same year with an assault on Te Tumu, which had by then been reoccupied by Ngaiterangi, taking it again. Te Waharoa then turned to Ohinemutu. A bloody battle took place outside the defences, but Te Waharoa fell short of taking the pa. Te Arawa continued their enmity with Ngaiterangi, with Te Pehu reoccupying Maketu in 1837 and attacking Maungatapu pa at Tauranga. A half-hearted response by Ngati Haua with Waikato and Ngaiterangi allies was directed at Maketu, but the assault was not pressed. Te Arawa raided Tauranga in return, but were satisfied by killing a fishing party rather than attacking defences.

The Ngati Haua/Ngaiterangi allies made two attacks on Maketu in 1839, both unsuccessful, with the attackers suffering greater losses. Te Arawa made a last raid on Tauranga in 1840, with an attack on Maungatapu, but made no serious assaults against the musket firepower within. The arrival of a Ngati Haua relief party changed the balance of power and the Te Arawa taua departed.

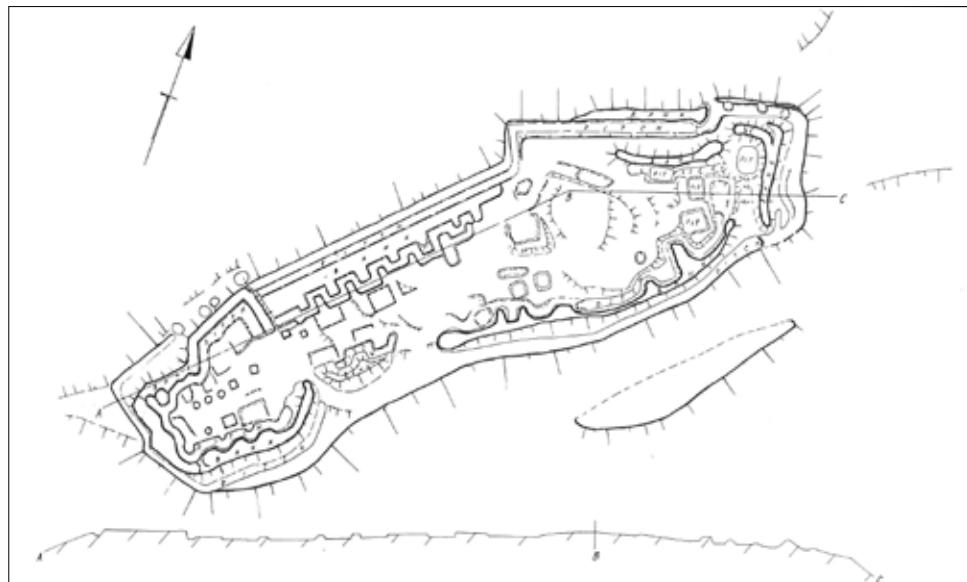
Many of the musket war engagements took place at a few key sites, such as Otumoetai (U14/202), Te Tumu, Maketu and Maungatapu. By the end of the wars, these sites had been adapted thoroughly to musket warfare (Walton 1998), with some Maori also adopting cannons to bolster their defences. Most of the pa of this period were sited in areas where there has been intense subsequent development. However, even when this is the case, such as at Otumoetai, archaeological information is still recoverable, as modern development has usually left some of the underground evidence intact.

In the course of the conflict, pa were redesigned to better accommodate fighting with muskets. Figure 7 shows the distribution of gunfighter pa in the Site Recording Scheme. These date from the Musket Wars through into the New Zealand Wars. The historical accounts suggest there should be more. A pa at Te Puna (U14/1422) has typical traverses in the trenches that were used for firing from rather than for inhibiting access (Fig. 18). Te Paripari, a site on a Historic Reserve at Ohope (W15/23; Kingsley-Smith 1971), is an example that well illustrates the form of these sites.

In 1840, the Treaty of Waitangi was brought to the Bay of Plenty. Ngaiterangi signed it at Tauranga. Iwi from the eastern Bay signed it, including Te Whakatohea, Ngai Tai and Ngati Awa. Tuhoe and Arawa declined to sign it, but by the 1860 Kohimarama conference, Te Arawa had also accepted the Treaty.

Following the signing, the British Government was represented in the Bay of Plenty region by Edward Shortland, with the title Sub-protector of Aborigines, who set up base at Maketu. The place of residence was a misjudgement—

Figure 18. Gunfighter pa map, site U14/1422.



effectively indicating government favouritism (Lousberg 2005: 68). He did not stay there long, as he went on an extensive South Island journey while in the post and then moved to Wellington. The site of his house at Maketu is recorded (V14/38).

British prestige suffered a severe blow in 1842, when Taraia from Ngati Tamatera avenged an insult by attacking a Christian pa at Ongare near Katikati, killing and eating some of its occupants, and the Government took no effective action in response (Lousberg 2005: 58–68).

The surface features of the Te Papa Mission site have been recorded (Mackay 1992), but there has generally been little archaeological study of contact period sites in the Bay of Plenty. The dimension that archaeology could bring to the historical record of this period is therefore absent.

During the more peaceful years of the 1840s and 1850s, the engagement of Bay of Plenty Maori in commerce expanded. They participated in the new market in Auckland for produce (Hargreaves 1959, 1961). Wheat growing and flour mills primarily fed this trade, but maize (*Zea mays*), potatoes and pigs were also substantial components (Hargreaves 1959: 65, 68). Some of this trade used small sailing craft owned by Maori. While this period of trade is often depicted as an unqualified success for Maori, it was not always so, with over-investment in mills and ships. The trade moved into recession in the late 1850s, before the New Zealand Wars impacted on the Bay of Plenty.

11.3 NEW ZEALAND WARS

The first phase of the New Zealand Wars, which took place in the Bay of Islands in 1845, had little impact in the Bay of Plenty. The commencement of the Taranaki and Waikato phases (1859–1862) also had little impact. Like other aspects of the Bay of Plenty's history, the wars were late in arriving there. Tauranga and Rotorua Maori were engaged in the establishment of Kingitanga in the 1850s, but the primary confrontations over land in the Bay of Plenty were not spurred by local settler pressure (Belich 1988: 76; Cowan 1923 (I): 141). As already noted, the Tauranga campaign followed the invasion of the Waikato, when Ngaiterangi and other eastern iwi allied with the Kingitanga and attempted to consolidate forces at Matata and Tauranga, anticipating a move to the Waikato. The principal engagements of 1864 took place at Gate Pa (in April) and Te Ranga. An assault on a well-prepared Maori position at Gate Pa by British soldiers and sailors was rebuffed with considerable losses. The surrounded defenders soon abandoned the position, which was converted into a British redoubt. Eight weeks later, an unfinished Maori fortification further inland at Te Ranga was taken by the British, with small losses on their side and much greater losses on the Maori side. Weapons were then surrendered (but not the new rifled guns) and land confiscation followed. Some land was subsequently returned and some was sold by Maori in a complex series of deals. Land was allocated to militia members, beginning the colonial settlement of Tauranga (Cowan 1923; Belich 1988).



Figure 19. Monmouth Redoubt, U14/174.

There are some traces of earthworks at Gate Pa (U14/192) and at Te Ranga (U14/191), where McFadgen (1977) demonstrated that techniques other than excavation can be used to define now-buried structures. The British defences from the period are best represented by Monmouth Redoubt (U14/174; Fig. 19). Durham Redoubt (U14/433), since destroyed, was the other Tauranga defensive work of the period. Other redoubts and blockhouses were built to secure the district. Many of the victims of the fighting from both sides are buried at the Te Papa cemetery (U14/189). This is a cultural heritage site that has great importance in connecting the present with the past.

The other military engagements in the Bay of Plenty get little attention in the recent histories of the New Zealand Wars. However, even if they were less important than others nationally, they were still significant for the Bay of Plenty area, and traces of them remain in the landscape. Some Ngati Porou from the East Coast had joined the Waikato War in 1863, as had some Tuhoe. In early 1864, a much larger group of East Coast King supporters and more Tuhoe who wanted to join the war, by then in its final stages, assembled at Matata. This Tai Rawhiti force sought Arawa approval to cross their territory, but it was denied. William Mair arranged for military supplies to get to Rotorua to assist Arawa. The resulting battle with Te Arawa took place at Ngauhu at the eastern end of Lake Rotoiti in early March and, after

some bloodshed, ended in a truce and a withdrawal of the Tai Rawhiti force. The latter retreated to Matata and then, 800 strong, advanced on Maketu. Here, there was a small British garrison in a redoubt (Fort Colville) on an older pa site (Pukemaire; V14/6), which was besieged in late April 1864. By this time, the Waikato War was over and motivation to continue the attack must have been waning. The garrison was relieved by shelling from naval ships and the arrival of McDonnell's Forest Rangers and Te Arawa forces from inland. The Tai Rawhiti force retreated eastwards in a running fight, suffering 50 deaths. Had this force not been thwarted at Rotoiti, they would have been able to join the Tauranga fighting. In either the Waikato or Tauranga conflict, their numbers may well have made some difference to the course of events (Stafford 1967, 1986; Walker 2007).

Soon after Te Ranga was taken by the British forces in 1864, the Pai Marire religion started to influence the defeated Tauranga Maori. At first, it remained true to its original peaceful, if anti-colonial, intent. However, events at Opotiki in 1865, with the death of Missionary Volkner, and at Whakatane, where the cutter *Kate* was taken and looted and three members of the crew killed, were violent and attributed to the influence of the new religion. Kereopa, the Pai Marire proselyte, was of Te Arawa, but his followers in the eastern Bay seem to have been primarily Ngati Awa, with some Whakatohea.

Led by Kereopa, the Whakatohea, some of whom had involvement in the Opotiki events, moved inland later in 1865 to Te Tapiri on the edge of the Ureweras, south of Murupara. Ngati Manawa resisted their movement and built gunfighter redouts at Te Tapiri (V17/13 and V17/33). Whakatohea, with Tuhoe allies, built opposing fortifications (V18/12 and V18/33). Nevin & Nevin (1980c) and K. Jones (DOC, pers. comm.) have reviewed these fortifications. Fighting consisted of mutual raiding. Eventually, Ngati Manawa withdrew and were relieved of the pursuit by a body of Te Arawa, near Murupara.

The Opotiki and Whakatane killings resulted in a column of government forces leaving from Rotorua. William Mair organised a force of Arawa and Ngati Rangitihi from Tarawera. It proceeded to Matata and was augmented by a force from Maketu. The party placed a Ngati Awa pa at Te Teko (V15/158) under siege. Te Parawai pa and other swamp pa on the Rangitaiki Plains were taken, and Omehu Pa on an island east of the Tarawera River was abandoned. The siege of Te Teko ended with the surrender of the garrison (Andersen & Petersen 1956; Crosby 2004). The supposed Opotiki offenders (except Kereopa) were amongst those arrested.

The Patea and Wanganui Rangers, operating out of Opotiki, took part in some other skirmishes in 1865 in the Waimana Valley. This followed colonial forces having been moved by sea to Opotiki in search of Kereopa. Confiscations of Ngati Awa and Whakatohea land followed these campaigns.

A minor conflict arose in 1867, when Ngati Piri Rakau (who had allegiance to Pai Marire) began harassing survey parties near Tauranga (see Stokes 2002: 506 for the precursors to this). One settler was killed. Ngati Piri Rakau were joined by some Ngati Porou and Ngati Raukawa. A Waikato Militia expedition engaged in some skirmishing inland from a colonial forces redoubt at Pyes Pa (U14/64). An Arawa *kupapa* force was raised to assist. This resulted in

destruction of Maori villages in the area and a predominantly one-sided (Maori) loss of life. This is known as the Tauranga Bush Campaign. A kupapa redoubt from the period (Moerangi) has been recorded by Jones (1983a). One village attacked was the pa Te Irihangā (U14/328). This site has been the subject of a conservation study (Bowers 1995).

Shortly after this conflict in 1867, a fortification was erected by Kingites at Puraku, west of Lake Rotorua. This was occupied by some of those who had been involved in the Tauranga fighting. It was a challenge to the *Queenite* (supporters of Queen Victoria's Government) Arawa. Arawa (led by Gilbert Mair) and militia from the Waikato Regiment soon outnumbered the occupants who, after skirmishing with the attackers, abandoned the fortification. Puraku Pa (U15/49) was mapped in the early 20th century (Cowan 1923: 162), but was largely destroyed in the 1960s (Mitcalfe 1968).

A single niu pole, which featured in Pai Marire religious practices, survives in the region at Kuranui (T15/193) (Stokes 1997: 5). The site has been the subject of an archaeological investigation (Peters 1980, 1990). A pa near Te Whaiti in the Whirinaki River valley (V17/11) is also recorded as the site of a niu pole and fenced enclosure.

After his escape from the Chatham Islands in 1868 and recruitment of followers to his Ringatu faith, Te Kooti Arikirangi first attacked colonists on the East Coast. His campaign then turned westwards, with a raid into Whakatane in early 1869. A small Armed Constabulary redoubt at Poronu alongside a Ngati Pukeko flour mill was attacked first. The civilian residents, both Pakeha and Maori, resisted from the redoubt for 2 days, but it was then taken and they were killed and the mill burnt. The Ngati Pukeko Rauporoa Pa on the west bank of the Whakatane River (aerial photograph in Jones 1991: 164) was then attacked with some loss of life amongst the attackers. The position was abandoned when a government relief force arrived. This was led by Henry Mair of the Opotiki Rangers, and included an armed constabulary and a kupapa force raised in Matata. Te Kooti's force then turned its attentions on Whakatane, looting and burning Pakeha traders' stores. Te Kooti withdrew up the Rangitaiki River in the face of growing opposition forces. A redoubt from this period survives near Puketapu hill above Whakatane. There is also a small redoubt on the highest point on Uretara Island in Ohiwa Harbour (W15/366), which is probably from this period (K. Jones, DOC, pers. comm.). The location of the Poronu redoubt and mill is known, but nothing has been visible above ground since before the time that James Cowan took an interest in it.

In mid-1869, Whitmore's Armed Constabulary established a series of fortifications up the Rangitaiki River as strategic positioning against Te Kooti. These were Forts Alfred, Clark (V15/560) and Galatea (V16/8). Forts Clark and Galatea have been excavated (Spring-Rice 1982, 1983a, b, 1987). Spring-Rice has established a far more complex history for Fort Galatea than is apparent in the written record. Galatea is now a reserve and has interpretive signs.

Following a pincer movement by two columns led by Whitmore and St John along the Whakatane River, fighting took place around Te Whaiti and

Ruatahuna. Te Kooti Arikirangi's Tuhoe allies were greatly weakened during the fighting, beginning a gradual decline in the forces he could muster.

The fortification line up the Rangitaiki River was not maintained for long, however, with forces being withdrawn later in 1869, though Galatea was reused at a later date by Te Arawa kupapa forces, as well as by the Armed Constabulary in 1871. Another Armed Constabulary camp of the period—Kaiteriria—was on a peninsula in Lake Rotokakahi (Green Lake).

Te Kooti Arikirangi moved west in mid-1869, surprising a small party of troops at Opepe (just outside the Bay of Plenty Conservancy, east of Taupo) and killing most of them. He was then engaged south and west of Taupo, returning into the conservancy area in early 1870, when he travelled to Ohinemuri. From there, he returned south and fought engagements with McDonnell's lead forces, including Arawa, at Tapapa—a Ngati Raukawa pa. Te Kooti retreated from Tapapa, losing his horses. There was a further engagement at Paengaroa, west of Oropi, in February, and he then moved south towards Ohinemutu. Most of the Arawa fighting men were absent, away with McDonnell. Gilbert Mair led an Arawa group from the McDonnell forces back just in time to reinforce the Mahao redoubt on Pukeroa Hill and thwart a truce parley session that was about to start. The Te Kooti forces then retired south in a running fight and then on to the Rangitaiki Valley (Binney 1995: 207).

That was the end of the New Zealand Wars in the Bay of Plenty. The opportunistic use of Te Arawa forces is a particular feature of the conflicts. While these forces were no doubt supporters of the Government, their involvement had, at times, elements of their seeking revenge against old rivals and, at others, of their being mercenaries. There is, of course, some irony in the fact that Arawa were not initially signatories of the Treaty of Waitangi, while the iwi who had signed promptly eventually had land confiscated.

At the southern boundary of the Bay of Plenty Conservancy, Armed Constabulary redoubts were erected along the Napier-Taupo Road in the wake of the attack at Opepe. The posts at Runanga, Tarawera and Te Haraoto are just outside the conservancy boundaries. They were garrisoned until 1885, but were not involved in any fighting. Mitchell (1984) has carried out excavations at several of these.

The archaeology of the New Zealand Wars in the region has advanced to the point of identifying many of the sites and mapping some of them. Excavation has been limited to two Armed Constabulary sites on the Rangitaiki River and at Runanga, but the results from these are not widely available. Unlike the other conflicts of the New Zealand Wars, there is little in the way of coherent accounts of the events of the wars in the region that focus on the Bay of Plenty and deal with it on a regional scale. The account above is drawn from several sources. The events are not a simple story, and the lack of comprehensive accounts may have inhibited fieldwork.

11.4 COLONIAL SETTLEMENT

11.4.1 Rural settlement

The first organised settlement in the Bay of Plenty area was by militia soldiers onto land confiscated at Tauranga. These were military settlements with relatively small block sizes. The larger blocks, which were allocated to officers, were near the sites of fortifications (as at Moerangi; Jones 1983a). Few of the first land-holders remained in residence for long. Undoubtedly, some were unsuited to farming, but the lack of markets for produce must have deterred others.

Some outstanding accounts of the experience of the pioneer European land developers in the region exist. Adele Stewart (1908) gave many details of her 19th-century life in Athenree. The house she and her husband lived in—Athenree Homestead (T13/751)—still stands and must have an archaeological dimension that could add to the historic account. Vaile's (1939) account of developing a large Broadlands estate in the early 20th century and a more recent account of the struggles of a post-First World War soldier-settler family, who tried dairy farming in the Whirinaki Valley southwest of Rotorua (Ellison 1956), provide economic and social insights from very different perspectives. They invite better understanding of the archaeological remains of the rural landscape of their time.

The first intensive settlements in the Bay of Plenty region were in the Katikati and Te Puke areas, and were the result of immigration schemes from Ulster (Gray 1950; Taylor 1969). Planned emigration from Ireland was, reputedly, a very rare event. George Vesey Stewart was the leader of these communities. His Katikati home—Mount Stewart—was recorded in the 1960s by Shawcross (1964: 83), by which time it was in a ruinous state.

The archaeological potential of the early rural homesteads of the Bay of Plenty is as yet unrealised.

11.4.2 Towns

Only a few examples exist of archaeology being practised within towns in the Bay of Plenty. The archaeological potential of the Te Aroha spa area has been surveyed (MacKay 1993), but there have not been any excavations. A mitigation excavation on an early town site in Tauranga demonstrates the research potential of such sites (U15/519; Bowers & Phillips 1997b). However, this had predominantly artefactual rather than structural finds, making the interpretation relatively limited in scope. Andrews (1990) reported on midden material from the Ohinemutu Hotel in Rotorua (U16/109), but this was, unfortunately, recovered without archaeological control, although it does demonstrate the potential of similar sites and the potential for urban archaeology in the earliest settled areas.

Timber towns have risen and fallen according to the fortunes of the industry. Minginui and Mamaku are smaller now than they were during the peak periods of native timber extraction. Both have ruinous buildings or former building sites that are now vacant.

The history of changes to buildings is often poorly recorded. Where buildings have been standing for a long time and have undergone additions, reductions, changes in use and decoration, they should be investigated. With the short history of standing buildings in New Zealand, ‘buildings archaeology’ has not often been practised or, where it has been, it is not deemed worthy of record. In the Bay of Plenty region, investigations of the structure of The Elms (Vennell 1984: endpapers) and the investigation of the former decoration and use of the Government Bathhouse in Rotorua, as shown in the on-site interpretation, are exceptions.

11.4.3 Energy

Geothermal energy

Geothermal energy development is relatively recent, mostly occurring in the second half of the 20th century. The availability of geothermal steam at the Kawerau pulp and paper mill was one reason for it being sited at Kawerau. Ohaaki uses steam from a geothermal field on the east side of the Waikato River. Domestic and small-scale industrial use of geothermal steam and hot water has long been important in Rotorua, aside from the use of hot water in the commercial spa developments.

Hydroelectricity

Direct use of water for motive power was a common feature of flour mills and gold processing in the early part of the European settlement of New Zealand. These uses are discussed later in this report (see section 11.4.5). New Zealand also has a long history of using water power for electricity generation. Early developments in the Bay of Plenty were the Okere Falls station on the Kaituna River and at Omanawa Falls near Tauranga. At Okere Falls, water was flumed from the top of a waterfall and fed through turbines. The site is ruinous today, but is on a DOC reserve and has some interpretation. One of the turbine cases has been removed from the site to sit beside an adjacent path with some interpretive signing; it has also received some conservation. The scheme was commissioned in 1901—one of the earliest in New Zealand—and supplied public buildings with lighting and sewage pumping. It was the first government-built hydro station in New Zealand. Its engineer—Lawrence Birks—went on to play a leading role in subsequent state power developments. The hydro station was last used in 1930.

A longer running development occurred at Omanawa Falls and elsewhere on the Mangapapa River southeast of Tauranga. This development started with the commissioning of the Omanawa Falls station in 1915 and culminated in the Ruahihi scheme in 1981. In 1920, Omanawa was extended with a turbine relocated from a Karangahake goldmine. It was a challenging scheme, with an underground power station and a tunnel intake. Omanawa Falls supplied electricity to the Muir’s Reef mine, after that site had failed in its own attempt at power supply. The early collapse of a canal on the 1980s Ruahihi scheme left a remnant not reused when the scheme was rebuilt. This can be traced in the locality. The original Maclarens Falls power station of 1921 was bypassed by the Ruahihi scheme. The Omanawa Falls station has recently been decommissioned. Because it is underground, there is little to see, but

the McLaren Falls power station is more substantial and quite prominent beside the Falls' access road. The dam for this station is still in use.

A further small scheme was built by the Whakatane District Council on the Karaponga Stream near Awakaponga in 1922. This scheme was fed from a low concrete dam, which was driven by a pelton wheel. The scheme was abandoned in 1938 (Anon. 1988: 94). A small scheme for lighting Te Aroha was commissioned in 1905. The reservoirs for this scheme still exist in the Tui Domain.

Modern developments in the region include Matahina Dam (36 MW) on the Rangitaiki River (commissioned in 1967) and, more recently, smaller schemes at Aniwhenua and at Whaeo on tributaries of the Rangitaiki River. At Matahina, archaeological remnants of the construction village and works remain in the area below the dam. Two hydro dams on the Waikato River are at the boundary of the Bay of Plenty Conservancy: Atiamuri (84 MW), commissioned in 1958, and Ohakuri (112 MW), commissioned in 1961.

Energy transport

Early hydropower developments tended to be close to the point of use. An early development of long-distance transmission of electric power in New Zealand was the Horahora station on the Waikato River, from which electricity was transmitted to Waihi. The developer was the Waihi Gold Mining Company (Rowe & McKay 1997), and operation commenced in 1913. The three-phase, 50 000-volt transmission line was supported on lattice steel towers that crossed the Kaimai Range via the Waiorongomai and Waitawheta valleys. The McLaren Falls power scheme was linked to this line (Stokes 1980: 295), which allowed power to be sold to Auckland, thus justifying the size of the scheme. It was later nationalised and the power line continued in use beyond the life of the Horahora station, which was flooded by the larger Karapiro Dam in 1947. Subsequently, the line was largely dismantled, but there is some remaining evidence of the line's pylons (Rawle 1981: 23). Rotorua was linked to the Waikato generation stations in 1926.

11.4.4 Communications

By sea

Small ports were a feature of the Bay of Plenty until the extension of the national railway system rendered them obsolete. The remaining port at Tauranga was small until development associated with the expansion of forestry exports in the latter part of the 20th century.

Ohiwa, Whakatane, Matata, Maketu and an inland port at Te Puke on the Kaituna estuary were all important small ports. There were many landing points around the Tauranga Harbour, including Mt Maunganui, Tauranga, Omokoroa, Katikati and Athenree (Hansen 1997). The landings were often the terminals of tramways for transhipment of logs or sawn timber. Although the harbour has two entrances, the main part of the harbour linking them is shallow, so that only shallow-draft vessels can use it as an inland passage, and then only at high tide. Athenree was important in the landing of heavy machinery for the Waihi mines before the railway reached through the

Karangahake Gorge. Archaeological remnants of some of these port facilities remain. An important one is the stone pilot jetty on the inside of Mauao (U14/361). The rock sea defences at the port entrance at Whakatane have related quarries and wharves on Moutohora (van der Wouden 1994: 8). These operated between 1916 and 1920.

Transport on Motiti Island involved a punt for carrying cattle launched from a rail system built in 1876 and a later breakwater called Patterson's Inlet, which was finished in 1913. At the latter, a slide was used for loading maize sacks onto scows. Despite the construction of these facilities, beach landings continued when the weather was suitable (Matheson 1979: 37, 42, 94).

Matakana Island is also dependent on sea transport. Tanker collection of milk on the island commenced in 1974, with tankers barged to and from Omokoroa. Before this, there was a launch used for a 'cream run', and from 1945 pine logs were rafted from the island to be milled at the Ongare Point mill.

Tauranga's port was initially at Tauranga itself. The first wharf at Tauranga opened in 1871. Today, the main port is at Mt Maunganui. Development here commenced in 1910, with a railway construction wharf used to supply the eastwards extension of the East Coast railway. Use of Mt Maunganui for export cargoes commenced in 1954. Dredging to deepen a harbour entrance channel started in 1961; maintenance dredging is ongoing. Work on the major modern port at Sulphur Point on the Tauranga side of the harbour started in 1968.

Shipwrecks and hulks

Shipwrecks can act like time capsules—providing details of the possessions of passengers and crew, cargo, and ships' equipment, which are not always available from written records. Bowers (1992) listed shipwrecks of potential archaeological value in the Bay of Plenty and Matheson (1999) provided a more general account of shipwrecks.

Harbour construction work at Sulphur Point, Tauranga, has exposed a timber-built ship (Hansen 1997). This is speculated to be the ship that Stack (1935: 40) recorded as a childhood memory—a Spanish ship of unknown name from Valparaiso, which was wrecked on the inner bar. Ingram (1972: 15) suggested a date of 1840 for this.

There are some well-known wrecks in the Bay of Plenty. In 1878, the steamer *Taranaki* ran into Karewa Island and sank. The site is now a recreational diving attraction. In 1879, the steamer *Taupo* struck a rock at Tauranga Harbour entrance; then, while under tow to Auckland in 1881, it foundered near Mayor Island (Tuhua) (Heath & McLean 1994: 16). It is the only shipwreck in the site record files (U13/161). This wreck site is a popular dive location. Damage to this wreck in the past by divers has resulted in an unsuccessful prosecution under the Historic Places Act. In 1921, the *Tasman*, also a steamer, struck a reef off Matata and sank in deeper water. This is also a diving attraction.

Ingram (1972) listed many small vessels lost in the Bay of Plenty in the 19th century. Maketu features prominently as a site for shipwrecks, starting with the wreck of the *Falcon* in 1840 (Matheson 1999: 79). Maori-owned vessels that took part in the trading of the 1850s were reportedly left to rot at

Maketu when the New Zealand Wars put an end to that commerce. Hochstetter (1867: 445) recorded a Maori-owned schooner rotting at Otumoetai on his 1859 visit.

Some of the early tourist boats on Lake Rotorua were burnt out on the lake shore either accidentally or deliberately at the end of their working lives (Stafford 1988: 72, 225). Remains of the *Alice*, which sank after striking a stump in the Ohau Channel, are reputed to remain where they sank (Stafford 1996: 65). These wrecks are a potential archaeological resource.

Shipwreck archaeology is little developed in the Bay of Plenty, and must have some greater potential. Finding the remains of the *Haws*, for instance, might provide a rare opportunity to study a trading vessel of the 1820s.

By river

Two rivers in the region have had a significant role in transport—the Kaituna and the Waihou. The Kaituna River was navigable by small vessels to a landing at Canaan near Te Puke. Once the railway reached Te Puke, river-based transport services ended, but they had always been limited by the state of the estuary mouth. The Waihou River was cleared of snags and bars over several years as part of Firth's Matamata Estate development. The landing at Stanley opened in 1880 (Vennell et al. 1951: 59). Firth's intention was to use boats to take wheat to his Auckland flourmill, but his port preceded the railway by only 5 years.

By road

The development of roads was linked to the development of ports and railways (Stokes 1980; Stafford 1986, 1988). The best port in the area—Tauranga—acquired its first useful wharf in 1871 and was a customs port of entry from 1873. By 1872, a coach road to Ohinemutu had been opened on the direct route via Mangorewa Gorge. This carried many international tourists and displaced the earlier main track from Maketu as the main route to the Lakes District. The Maketu route only recovered its modern prominence as State Highway 33 after the Rotorua rail link rendered Tauranga less important as a staging point for Rotorua tourist traffic.

By 1873, a complete coach road existed from Taupo to Napier, constructed largely as a result of the efforts of the Armed Constabulary. This followed the earlier telegraph route. Taupo was linked to Rotorua by road from the early 1870s. In 1880, the Armed Constabulary started construction of a coach road to Rotorua, which crossed the Mamaku Ranges from Cambridge (Vennell et al. 1951: 103). This road opened in 1883 and preceded the railway. Coach transport between Rotorua and Whakatane was not possible until 1907.

The route over the Kaimai Ranges to Tauranga had a low priority for development. It was a bridle track and stock route from the 1880s, and achieved coach route standard by 1911 (Stokes 1980: 216). A key bridge connected the road route from Tauranga to Athenree in 1880, but the connection of this with Thames was poorly surfaced and not reliable enough for regular traffic until the 20th century. Early eastwards transport in the Bay of Plenty region was generally along the beach, but by 1887 a dray road had

been constructed as far as Opotiki, with ferry crossings at the Maketu and Waihi estuaries. In the early 20th century there was a vehicle ferry at Ohiwa, but this was soon bypassed by an inland road.

Around Tauranga, the sealing of many roads was not completed until the 1930s (Stokes 1980: 229), and this was no doubt the case for many other roads in the Bay of Plenty region. Before sealing, wet weather would have rendered many roads impassable.

By railway

Abandoned parts of formerly more extensive railways are prominent archaeological features in the Bay of Plenty region. The expansion of the railways in the area started with the bridging of the Waihou River and the completion of a line to Te Aroha in 1886. Te Aroha's prominence as a spa town started to be eclipsed once the railway reached Rotorua from Putaruru over the Mamaku Plateau in 1894. Other schemes for a route to Rotorua from Tauranga via Te Puke were promoted but never started. The link north from Te Aroha to Thames opened in 1898, and the line through the Karangahake Gorge to Waihi in 1905. This line did not extend to Tauranga until 1928. Earlier, in 1910, a line had commenced at Mt Maunganui. This reached Te Puke in 1913 and Matata in 1916. It was linked to Tauranga across the harbour in 1924 and extended to Taneatua by 1928. The line to Taneatua was intended to extend to the East Coast, but this last link was only commenced from the Gisborne end and was never completed, being abandoned as a branch in 1959.

Until the Tauranga Harbour crossing was built, the construction of the railway was serviced by sea from a wharf at Mt Maunganui. This Mt Maunganui branch fell into disuse and was only revived once the timber industry port facilities were developed at Mt Maunganui in the 1950s.

There was sustained interest in extending the rail network from Rotorua to Taupo. This link to Taupo was a political issue for much of the early 20th century. The Taupo Totara Timber Company, which had a line of 3 foot 6 inch gauge extended from Tokoroa to Mokai, 20 km from Taupo, was ever hopeful of selling this to the Government and lobbied against any alternative route to Taupo. However, the light rail, steep grades and tight track radii were below the Government railways standards, so this transfer of ownership never occurred. This line ceased operation in 1944.

A start was made on a railway from Rotorua to Taupo in 1928, but this was abandoned in 1929, with no track ever laid. The formed rail bed, which remains as it was when abandoned, is a prominent feature on the west side of State Highway 30's exit from Rotorua. It has multiple work sites, nicely illustrating how construction work was organised.

The post-World War II expansion of the timber industry saw rail lines extended from Edgecumbe to Kawerau and Murupara opening in 1955. The line from Putaruru to Kinleith is just beyond the borders of the Bay of Plenty Conservancy, but has considerable economic significance within the area. This was converted from the Taupo Totara Timber Company light rail line in 1950.

The Karangahake Gorge line was bypassed by the Kaimai Tunnel, which opened in 1978. The Paeroa to Te Aroha link was dismantled in 1996. Today, the formations of the former rail tracks are prominent archaeological features between Waihi and Apata and between Te Aroha and Paeroa. Rail passenger services to Tauranga and Rotorua ended in 2001.

The Whakatane branch line is now disused, and the Taneatua and Rotorua lines little used. All are potential archaeology in the making.

There has been little exploration of the archaeology of railways in the Bay of Plenty area. A happy exception is a survey by Moore (2001b) of the piers of two Athenree railway viaducts, which were later destroyed by road works.

By air

The changing needs of aviation often result in earlier facilities becoming redundant. The former Rotorua Airport was closed in 1964 and is now covered by the suburb of Fenton Park. It would not be surprising if there was still some evidence of the airfield under this suburb, despite the redevelopment. Aviation in Tauranga received a boost during World War II, when the pilot instructor training school was based there. Motiti Island has been serviced by an air taxi from Tauranga since 1947 (Matheson 1979: 54). Matakana Island also has an airstrip.

The early use of small aircraft for aerial topdressing led to the construction of many farm air strips. Fertiliser storage facilities often adjoin these. The emergence of faster, higher capacity aircraft has rendered some airstrips obsolete. It can be expected that there will be some abandoned strips in the Bay of Plenty region.

An airstrip was developed on the summit of Mt Tarawera to allow tourists to fly in from Rotorua. This opened in 1979 (Stafford 1983: 236), but is no longer used. It is a prominent feature from the air.

Aircraft wrecks

The archaeology of plane wrecks has not been an active part of academic archaeology in New Zealand. In places where air warfare has taken place, archaeological investigations have been able to elucidate poorly recorded combat events or reconcile crash sites with recorded losses. However, there is not much plane wreck archaeology potential outside these combat areas, where there are fewer plane wrecks and much better records. Stafford (1983) recorded numerous crashes in the Rotorua area. The best-known crash in the Bay of Plenty area was that of a National Airways Corporation Douglas DC3, which crashed onto the west side of the Kaimai Ranges at Mt Ngatamahinerua in 1963, with 23 fatalities (King 1995: 78). The wreckage now lies beneath rock debris that was deliberately brought down from a bluff by explosives to bury it (Lockstone & Harrison 2000: 108). There are no aircraft or aviation sites in the NZAA Site Recording Scheme site records.

Telegraph

The ongoing disturbance in the King Country, south of the confiscation line in the Waikato, after the New Zealand Wars made finding a telegraph route between Auckland and Wellington that avoided this area attractive. The route chosen was through Tauranga, Rotorua, Taupo and Napier. The telegraph reached Tauranga from Wellington in 1870 and was connected to Auckland by 1872. The route was not completely free of conflict though (see Monin 2001: 220 for problems in Hauraki), and in 1869 Bay of Plenty cavalry at a stores post at Opepe, which was on the telegraph construction route, were surprised by a raiding party led by Te Kooti, resulting in the loss of nine lives.

11.4.5 Industry

Gold and base metals

Stokes (1980: 276) recorded the history of gold prospecting in the Tauranga/Te Puke area. A small amount of rock was crushed at the Eliza claim, south of Katikati (Downey 1935: 254). Muir's Reef, south of Te Puke, was a much more substantial effort, with a number of claims being made there and one substantial mining effort resulting, which operated from the late 1890s until 1928 (Downey 1935: 252; Taylor 1969: 123–134; Stokes 1980: 278–280). Some prospecting also occurred around Rotorua in the late 19th century (Stafford 1986: 403–405), and one short-lived mine operated from 1899 to 1901 (Robinson 1961).

There was much greater mining activity along the Kaimai Range, particularly in the west and north of the area. This area contains most of the recorded sites of mining activity (Fig. 17). The Waiorongomai field, south of Te Aroha, started with a rush in 1880, but it was not until the following year that a substantial reef was found. Its remoteness resulted in the Piako County Council building a tramway (T13/108) to access the reef, including three self-acting inclines (Twohill 1988). Many of the features of the mining, mine settlements and the tramway have been recorded, but these have not been mapped in detail. Much machinery is still *in situ* on this field, which consumed much capital for a small return. Site T13/157 is a compressor powered by a pelton wheel. Site T13/208 is the former town of Quartzville, served by the tramway. Mining stopped in 1921 (Anon. 1981, 1992; Moore & Ritchie 1996: 177–188), and today the valley is a DOC reserve with good tracks and interpretation.

The Tui mine, just north of Te Aroha, opened around 1890 and produced metal sulphides that contained gold and silver. The treatment process that was first tried did not work, and the mine closed soon after. There was some surface working of the deposits in the 1930s and more substantial underground working from 1967 to 1974. Ore was concentrated on site and then shipped overseas for smelting. A substantial slimes (fine ground wastes) tailings dam remains on site.

The gold and silver mines at Karangahake were more successful and were sustained over a longer period. Reefs along both sides of the Waitawheta River were mined and a series of batteries crushed the mined ore. Mines



Figure 20. Pelton wheel at the Woodstock Battery, Karangahake; T13/289.

operated from 1882 to 1914, with a final effort in the late 1930s. Tramways (several recorded under T13) and aerial ropeways moved the ore from mines to the batteries. Major batteries included the Crown, Woodstock and Talisman (T13/186), but there were other smaller ones as well. The batteries were water-powered (Fig. 20) with water drawn from dams on both the Waitawheta and the Ohinemuri Rivers. Later, power was provided by a coal-fired power house, some of which was used to run dewatering pumps for the deeper levels of the mines. There is substantial archaeological evidence in the area. Many of the sites are recorded, but not mapped in detail. Hence, in the intensely used area near the junction of the rivers, there is a mass of evidence

that is not easily resolved into different structures or periods of use. Some metalwork, including a pelton wheel, remains *in situ*. The area is now a DOC reserve and some track development has taken place. However, most of the interpretation for visitors is on the north side of the Ohinemuri River, outside the Bay of Plenty Conservancy. The area is a substantial heritage resource and needs more archaeological mapping, resolution of the evidence to the particular historical structures, and further interpretation.

A smaller operation was the Treasure Island Reef mine at the north end of Waihi Beach (Downey 1935: 249; Moore 1997). This operated from 1898 to 1910. The drives from this mine are currently used as part of a sewage outfall.

Sulphur

Sulphur is a natural product of thermal areas and has been mined in a number of locations in the Bay of Plenty area. The White Island sulphur mining is the best known example, occurring from the 1870s to 1928 under a series of operations. The site of the last mining operation is recorded as W15/577. An early mine was associated with a fertiliser processing works at Tauranga, the first in New Zealand. This failed after a short period of operation from 1884 to 1886 (Bellamy 1991: 5). It then reopened for a period in the 1890s, but after that there was no further local production of fertiliser until 1958 (Bellamy 1991: 113). The name Sulphur Point in the Tauranga port area relates to the first fertiliser activity, of which there is no other recorded remnant. Sulphur was not the only product mined on White Island. Guano from the gannet colonies was also mined, and the combined sulphur and guano, which was sold as a fertiliser, probably owed its efficacy to the latter product.

Sulphur was mined at Onepu near Kawerau (V16/67) from 1887 to 1898 (Seccombe 1959; Moore 1991: 16–17). It was initially shipped to Auckland, but later some went to the Sulphur Point works. Other sulphur mines include those of Moutohora (worked between 1876 and 1894 (Moore 1994; van der Wouden 1994: 6)) and several locations around Rotorua—Ohinemutu, Tikitere and Taheke (Stafford 1986: 319). Sulphur from the latter two sites

was transported by barge across the lakes to the railhead at Rotorua. This industry started once the railway made transport possible and continued only as long as the limited deposits lasted.

Quarrying

Railway ballast was mined at Moturiki Island for use in the eastward extension of the East Coast railway (Stokes 1980: 225). The site is clearly defined. The quarry area was later used for a marine mammal exhibit. A quarry in the Athenree Gorge was worked for railway ballast during the expansion of the railways system (Stott 1978: 9). There are other prominent quarries at Papamoa and Ngongotaha. The andesite quarries on Moutohora (W15/595) have been mentioned already (see section 11.4.4) (Moore 1987; van der Wouden & Moore 1994).

Kauri gum

Maori were trading in gum from Katikati at Te Papa in the 1860s (Robley picture in Melvin 1990: 30). Stokes (1980: 271) mapped kauri gum areas around Katikati, shoreward of the 19th-century bushline, and recorded these areas as having been dug for gum by local Maori from the 1880s.

The seaward part of Matakana Island was dug for kauri gum in the first decade of the 20th century (Stokes 1980: 272). This would have been along the sand ridges where kauri was more likely to have grown. No recorded sites relating to this have been reported, but they may have been damaged by recent exotic forestry activities.

Flax

Flax production by Maori had an early peak in the period leading up to the New Zealand Wars, with production of the basic fibre and resulting products. Van der Wouden (2001: 76) noted a rope works at Matata in the 1850s. From this period, there is also a record of a Maori road in the swamp near Awakaponga, which was built for flax haulage.

During New Zealand's long depression in the 1880s and '90s, the flax industry revived, with many mills established on the Kaituna and Rangitaiki lowlands. However, the industry was largely run on an extractive rather than a sustainable basis, and as land drainage advanced, the areas available for harvest declined, so that the industry had died by the 1930s (Stokes 1980: 269). Some early flour mills were converted to flax mills; for example, the water-powered mill at Wairere Stream in Whakatane milled flax from about 1890 (van der Wouden 2001: 80).

Land Drainage

Land drainage was central to the change in land use of the wetlands from flax farming to dairying. Small-scale land drainage works were undertaken by individuals or small local groups with some effect in creating pasture land, but the large-scale works that were needed required government support to succeed. As the scale of the work increased, the technology used advanced from hand labour to large barge-mounted draglines.

There was no effective flood protection and land drainage scheme on the Kaituna Waihi swamp until the 1950s (Stokes 1980: 400). Once completed, this allowed a substantial expansion in agricultural production in the area. The history of the Rangitaiki Plans drainage is a complex one of Drainage Boards successively collapsing in 1900 and 1910 (Gibbons 1990). The Lands Department took up the task in 1910 and completed a large part of the drainage work over the next two decades. Local elected control was resumed in 1957. Flooding from the three rivers crossing the plains was still a problem, but in the 1970s this was corrected through major river-flood training works, which were undertaken by a catchment commission using government funding.

Dairy farming

Small-scale dairy farming was a feature of early colonial settlement in the Bay of Plenty area. Its expansion required non-perishable products that could be exported. The earliest dairy industrialisation was cheese production (cheese being a relatively long-lasting and transportable product). Cheese factories commenced operation in Tauranga and Katikati in 1884 and in Te Puke the following year. Typically, these were cooperative efforts. The Katikati factory failed financially a few years later.

When refrigerated transportation became available, there was the opportunity for wider distribution of butter. Butter manufacture on a commercial scale began more than a decade later than cheese production. Dairy factories opened in Te Puke and Katikati in 1902 and in Tauranga in 1905. Many factories in the Whakatane area opened from 1900 onwards. These were eventually amalgamated into one (Anon. 1988: 40). A dairy factory that produced butter opened at Ngongotaha in 1910. The Bay of Plenty region was noted for dairying, not only because grass grew well there (though lime topdressing was needed), but also because supplementary fodder crops for feeding to dairy cattle could be readily grown (Stokes 1980: 245).

Today, the pioneer dairy factories have been replaced by large centralised plants, such as that at Edgecumbe. However, the old buildings often survive—for example, the Katikati factory building, which is now used as a restaurant.

Meat processing

With the problem of bush sickness (see section 5.6), it is not surprising that the Bay of Plenty area was not a leader in meat export. Local investors set up the Whakatane meat works, which opened in 1917. However, these works lacked a rail outlet and products had to be transferred to ships offshore by lighter, and even that required an upgrading of the Whakatane River outlet. Thus, the enterprise quickly failed, closing in 1924. This early failure resulted in stock being processed outside the district, although town supply needs led to the Tauranga Council establishing an abattoir in 1925. The Motuohora quarry, the port works and aspects of the plant—now the site of the Whakatane board mill—are archaeological remains of the meat works.

Cropping and horticulture

Early cash cropping in the Bay of Plenty focused on maize. Once it was shucked and dried, maize had a relatively high value in relation to its weight. The primitive transport facilities—by cart and small steamer—must have increased costs, but the widespread growing of maize means that it must have been profitable. Both Maori and Pakeha grew maize. Maize-drying cribs were once common in fields in the Bay of Plenty. Maize was later grown mainly for pig food rather than as a cash crop, though modern harvesting equipment has led to a recent increase in maize cropping.

Some wheat was grown in the area. There were early water-powered flour mills at Waihi Village—today part of the buried village site—and at the Wairoa and Waimapu Rivers near Tauranga (Bellamy 1982: 204–207). Umuhika (V15/16), near Whakatane, was a Maori-owned mill destroyed in the wars of the 1860s, which has been crudely investigated by Parham (2000). A Ngati Pukeko-owned mill at Poronui near Whakatane was attacked by Te Kooti in 1869.

The Wairere Stream flour mill in Whakatane was Maori-owned. It was built in 1880 by Ngati Awa. There was a further Maori-owned mill at Matata (van der Wouden 2001: 80). The NZAA Site Recording Scheme has flourmill site records from near Rotorua (U15/75 and 76) and inland from Matata (V15/16).

An experimental fruit-growing station was opened by the Government in 1906 at Tauranga, which led to the establishment of a citrus-growing industry around Tauranga. Lemons (*Citrus limon*) and grapefruit (*Citrus x paradisi*) were the main crops. Peaches (*Prunus persica*) and pears (*Pyrus communis*) were commercially canned at Tauranga for a short period after 1915.

Motiti yielded substantial crops of kumara up until the onset of a fungus disease in 1946. In the early 20th century, kumara were hauled on local craft to Tauranga and then by coastal ships, along with grapefruit, to southern ports (Matheson 1979: 102–107).

The substantial expansion in production of kiwifruit (*Actinidia* spp.) and avocados (*Persea americana*) is a much more recent development, dating from the 1970s. The kiwifruit revolution in the last 30 years has substantially changed the landscape in the lowland central Bay of Plenty. The requirement for level plots to allow kiwifruit support frames to be erected has meant that many older features of the landscape have been destroyed by earthwork re-contouring.

Indigenous forestry

The completion of the Rotorua railway opened up the Mamaku Range and the areas surrounding the Rotorua Lakes to logging, allowing haulage of logs and, particularly, sawn timber. Forests were also logged along the margins of the Rotorua Lakes. On Lake Rotoiti, barges were used to haul logs to a major sawmill at Mourea. A short tramway was then used to move sawn timber to a wharf, following which it was barged across Lake Rotorua to the railhead. The early exploitation of timber in the Kaimai Ranges was limited by the bush line being remote from the harbour edge. The demand for timber for the Waihi and Ohinemuri mines led to tramway operations in the Waitawheta valley and from the inland Katikati area to Waihi. These were

exclusively kauri operations, operating at the southern limit of kauri forests (Stokes 1980: 270). *Kauri dams* (which used the sudden release of water to drive logs floating in the dam and in the stream bed downstream) were used as part of the Katikati operation (Diamond & Hayward n.d.: 6). Some kauri dams are recorded in the archaeological site records (T13/761 and 762). A steam-powered mill associated with this operation was situated in the Tuapiro Valley. Later, there was a mill and wharf at Ongare Point. Logging in this area ended in the 1930s. Further south, the opening up of Crown Land inland of Tauranga to logging early in the 20th century led to mills being established at Oropi and Omanawa. Tramlines fed these mills and carried sawn timber away. Stokes (1980: 275) recorded the routes of tramlines and the locations of mills and wharves associated with this logging, which declined through to the 1930s. Tramway beds are recognisable in much of this area.

Mills for indigenous forest logging were established at many locations. There were substantial mill operations at Waimana, Manawahe, Waiohau, Te Haehaenga in the Tarawera valley, and Rotoma.

Bush tramlines

The most remarkable of the Tauranga tramlines was the Leyland O'Brien-owned system, which fed from the top of the Kaimai Range down to Omokoroa (Yonge 1985: Map 6). The track was not lifted until 1969 and much of the track bed is now a recreational walkway. Some Tauranga tramlines are recorded in the Archaeological Association Site Recording Scheme (e.g. U14/1341, 2188), but with minimal detail.

Mamaku township was the main forestry centre during the period of indigenous forest logging in the early to mid-20th century. Many tramlines radiated out from it (Mahoney 1998). At one time there were up to five interconnected tramlines, one of which was run by New Zealand Rail (NZR). Sawmills at Mamaku and others near Rotorua were fed by tramlines and rail. Gamman's Tram was the last one working; it stopped operating in 1955. Mamaku was the centre of a local industry that produced motorised rail tractors for hauling logs on tramlines. These were more practical than steam locomotives, especially when small old steam engines became rare at their New Zealand Rail source (many were former NZR locomotives). Rail tractors from Mamaku were used there and at Matahina. They made use of the weight of the logs on their driving wheels in a way that was impossible to achieve with steam power (Mahoney 1998).

The Mamaku Plateau was also logged from centres other than Mamaku. Bartholemew's Tram ran southeast from the Putaruru to Rotorua railway, and Selwyn's Tram ran northeast into the bush a little further west. Some of the tramline evidence here has been recorded: V15/93 (a tramline) and V15/94 (a tunnel on a tramline).

The Matahina tramline, which ended at a railhead at Edgecumbe, had multiple users and was incorporated as an enterprise on its own in 1928, coincident with the New Zealand Rail service reaching Edgecumbe. There were sawmills at Edgecumbe and Matahina, so the tramline hauled both logs and sawn timber. The Matahina tramline was initially built to service indigenous forest logging at Matahina bush, but the planting of the privately owned exotic

Matahina Forest meant it switched progressively to hauling exotic timber. From 1939 on, it also supplied the Whakatane Board Mills, a haul of up to 60 km. This tramline was upgraded in 1941 to use heavier ex-NZR class Fa locomotives. It continued hauling more exotic timber over time until 1966, when the completion of the Matahina Dam blocked its route. By that time, it was paralleled by New Zealand Rail's Murupara branch line to the east, which had been built to service the Tasman pulp and paper mill at Kawerau. One of the Matahina tramline locomotives, a 0-6-2 Fa tank engine, is now part of the Goldfields Railway Society's collection at Waihi. Parts of the Matahina Tramline formation survive in the forest (Stott 1978: 57).

In the central part of the region, the Bay of Plenty Timber Company had a tramline in the Pongakawa valley, which serviced the cutting of indigenous forest. Other shorter tramlines fed down to the eastern end of Lake Rotoiti (Yonge 1985: Map 7).

It is noticeable how closely the development of indigenous forestry followed the extension of the railways. The pattern of development followed by the kauri logging industry in the north of the North Island, where water transport was all important, was not followed in the Bay of Plenty. While some local use of timber (such as at the Waihi mines) was important, servicing remote markets accessible by rail seems to have been more dominant in the Bay of Plenty.

Exotic forestry

Exotic forestry development was perceived as a way to utilise land that was affected by bush sickness and not considered suitable for pastoral use. This was combined with the realisation that the indigenous forest resource was finite and would need to be substituted, if only for the domestic market. State afforestation began with a nursery at Whakarewarewa in 1897, and planting started in 1901 with the use of prison labour—a special prison was established for this purpose at Waiotapu, which operated until 1920 (Boyd n.d.: 12–21). A prison camp is recorded as U16/145. Paid labour had to be used to supplement prison labour and eventually this proved to be the only practical way of establishing large areas of forest. Private planting of exotics also took place at Matahina and around Tokoroa. These companies eventually became New Zealand Perpetual Forests, then New Zealand Forest Products (Healy 1982). The large expansion of the Kaingaroa forests occurred in the early 1930s, when relief scheme workers planted large areas in radiata pine (*Pinus radiata*). The maturation of these forests caused changes in the way sawmills operated. The Waipa Mill near Rotorua was opened in 1939 by the Government to experiment with how to mill exotic timber. This subsequently became the model for other large centralised mills that processed exotic timber. Substantial private plantings of pine were made on Matakana Island from the 1920s.

These vast pine forests in the central North Island contained more wood than could be used as sawn timber, so experimental work was carried out to investigate the suitability of *Pinus radiata* for pulp and paper. This resulted in the establishment of the Kinleith pulp and paper mill in 1953, and the Tasman Mill at Kawerau in 1955. The development of log exports also followed, with the Port of Tauranga becoming a specialist operator in transferring logs from land transport to ships.

The infrastructure of the camps used in the earliest pine planting programmes is an archaeological resource (Boyd n.d.: 72) on which more work could be done.

Oil

The geology of the Bay of Plenty is not favourable to oil. Although one oil seep is known at Kerosene Creek near Waiotapu, the generally held geological explanation is that this seep relates to a buried swamp or other vegetation. However, this did not prevent unsuccessful drilling investigations in the 1900s and 1960s (Annabell 1977: 65–6).

Tourism

Tourists have always been drawn to the Rotorua geothermal area. Before the Tarawera eruption, the tourist route was from Tauranga to Ohinemutu and on to Te Waihi Village, which was a centre for accommodation and for the Maori guides who led tourists onto the Pink and White Terraces (Stafford 1986: 232–245). There has been some archaeological investigation of this at Te Wairoa and public presentation of the excavations and the portable finds (Appendix 5; Simmons 1991). The destruction of the terraces and Te Wairoa during the Tarawera eruption of 1886 greatly reduced the attraction of the area and the tourist trade declined. Following this eruption, the setting-out of the modern town of Rotorua, the arrival there of the railway in 1894, the erection of hotels and the promotion of thermal attractions close to the town were the foundation of Rotorua's recovery. For a period around 1900, the town had no elected local government but was run by the Secretary of the Government's Department of Tourist and Health Resorts. The power station (see section 11.4.3), town lighting, sewage disposal and the Tudor-styled bath-house (now the museum) were built under this system. The bath-house opened in 1908 on the occasion of a visit by the officers of the Great White Fleet.

On the arrival of the railway in 1886, Te Aroha had a brief period of glory as a spa. However, the government promotion of Rotorua and the extension of the railway there soon left it as a site for local use only.

12. Conclusions

12.1 SUMMARY

There is no direct archaeological evidence that Maori occupied the Bay of Plenty region prior to the Kaharoa Ash eruption of about AD 1305. However, there is some evidence that the vegetation of the area started to be disturbed slightly before this date. Early Archaic occupation of the region was slight. Relatively few sites are known and these have been little studied. As is the case elsewhere in New Zealand, favoured sites were places close to the sea edge, near deep water, just within the shelter of the mouths of harbours and estuaries. The artefacts from these sites show a typical range of the forms expected from Archaic sites. Little is known about the economy of these early Polynesian residents. Some moa bone has been reported, but the extent of use of these birds for food is not known. From the very earliest times, Mayor Island (Tuhua) was a source of obsidian for all of New Zealand, so the Bay of Plenty, even if sparsely populated, was part of the wider pattern of settlement and occupation of New Zealand. Argillite in the form of adzes or stone came to the region from the northern South Island. Such extensive trade and movement of materials was typical of the early Polynesian settlement of New Zealand.

In contrast, later Maori occupation of the Bay of Plenty was extensive and has a substantial archaeological presence. Occupation flourished around the harbours, along the coast, on the favoured offshore islands and around the Rotorua Lakes. Sea resources and places for cropping were clearly important, with the volcanic ash soils being favoured. From about AD 1500 onwards, pa were being built—large fortifications in some places—implying the mobilisation of large social groups. The tension that pa reflect may have resulted from threats external to the Bay of Plenty region, but was likely to have been generated within the region.

There is little archaeological detail of the transition period from the Archaic to later Maori settlement periods. The transition is not represented in archaeological sites in the region and has to be inferred by analogy with the process as recorded elsewhere in New Zealand. There was some cultural change in the period after AD 1500, but a lot more work is needed to elucidate this. Given that this change probably relates in some way to population growth, it must be possible to investigate this in regions such as the Bay of Plenty, where populations were large. The wetland sites have, to date, been the richest source of evidence about past ways of life and can tell us a great deal about particular subtle and difficult issues, such as temporal change in arts such as wood carving. The carved combs from the Kauri Point Swamp are a case in point.

The contact period of the Bay of Plenty area was long because European influence was late in arriving compared with other parts of New Zealand. As yet, the archaeology of this period is very little explored here, despite there being considerable potential in gunfighter pa, flour mills and known historic settlements.

Historic non-Maori archaeology in the Bay of Plenty region is represented by some work done on gold mining and indigenous and exotic forestry. Economic development became widely established in the region only in the second half of the 20th century. Thus, there is still considerable unrealised potential in the archaeology of rural and urban settlements, and the industries and communications of the region.

Some of the distinctive features of the archaeology of the Bay of Plenty include:

- The low frequency of Archaic sites.
- The lack of evidence of occupation before the Kaharoa Ash eruption—a clear marker through the coastal part of the Bay.
- Sites rich in worked wood.
- Sites with rock carvings and painting.
- The high density of Maori sites along the coast and up the rivers.
- The considerable amount of largely unpublished information available from sites excavated for development mitigation.
- The general lack of evidence of cultural differentiation through time after the Archaic period, with the particular exception of the change in wooden comb style at the Kauri Point Swamp site.
- The scarcity of evidence for use of birds or mammals for food.
- The transition from pre-European pa to gunfighter pa dating from the 1820s.
- The presence of gunfighter pa dating from the 1820s to the 1970s, and their contrasts with European (Armed Constabulary) redoubts.
- The under-development of historical archaeology, which, despite the relatively recent development of the region, has considerable potential.
- ‘Literary’ sites of Elsdon Best, Adele Stewart, the missionaries in general and Edward Shortland.

The potential exists for more to be made of archaeological sites in cultural tourism in the Bay of Plenty region. Appendix 5 explores this in more detail. The existing sites available to the public are generally not presented well, with the particular exception of the country’s only commercial archaeological site, Te Wairoa, the Buried Village. Where there is on-site interpretation, little information is available about it elsewhere to alert visitors to the site as a potential place to visit.

12.2 RESEARCH ISSUES AND OPPORTUNITIES

12.2.1 Prehistoric archaeology

More direct evidence needs to be sought for the use of the horticultural soils on sand dunes and ridges. The alternative interpretation of these disturbed soils—that they were the result of fern root gathering—cannot be discounted on the evidence available at present. Application of phytolith and pollen identification techniques to investigate whether or not cultivated plants were once present at these sites is urgently needed.

To date, the museum collections of artefacts have been little explored. They must have far greater potential for elucidating types, artefact type distributions and source materials.

The potential of wetland archaeology is well demonstrated in the Bay of Plenty, particularly at the Kohika and Kauri Point Swamp sites. While exploration of such sites requires considerable resources, it can be highly rewarding. The number of known swamp sites is not high, however, and expanding the number known is not easily achieved by field survey. Talking to land owners and following up spot finds are the most useful approaches, but to be successful both approaches need archaeologists resident in the area. Archaeologists in museums are most likely to hear about chance discoveries.

The continued discovery of rock art makes it a field of some potential interest, along with the possibility that there are rock shelter floor deposits related to the art.

Site recording away from the coast is patchy. There are some areas, such as Reporoa, where pa sites can be seen from the road, but no sites have been recorded. Generally, around the Rotorua Lakes, pa seem to be over-represented in the records compared with undefended sites. Reports by Stafford (1994, 1996) on Maori associations with localities in the area suggested that this is a sampling problem.

Undefended sites with relatively long-term occupancy are under-represented in the excavations that have been undertaken. Such sites may yield a wide variety of evidence and are worthy of more attention than they have so far received.

As would be expected, mitigation archaeology is concentrating on areas where there is development pressure. Although considerable resources are available for this work, there is a case for carrying it out more discriminately than has generally been the case so far. Additional records of pit outlines, midden patches, oven pit scatters and simple counts of common shellfish add little to the overall sum of knowledge. Instead, a greater intensity of work on smaller areas using consistent methods would likely provide more valuable information.

Overall, future work on the prehistory of the Bay of Plenty area needs syntheses and approaches that can be tested using the evidence commonly found in the archaeological investigations that arise from the mitigation of modern development. These syntheses are likely to be local rather than regional in scale, and they would be best developed by the people doing the mitigation archaeology. Territorial and central government, universities and non-governmental organisations such as the New Zealand Archaeological Association could assist in this development.

12.2.2 Historical archaeology

The underwater archaeology of the Bay of Plenty is little developed. There are certainly unlocated wrecks and hulks. Improving knowledge of these could start with compiling records of known wrecks. Ship archaeology is often opportunistic and reliant on new discoveries, but pursuing some specific research questions based around known wrecks may be productive.

There has been some archaeological recording of goldfields, although this has mainly involved noting locations of sites that have resulted from fieldwork, rather than detailed mapping of the sites themselves. Many of these sites will no doubt prove to be very extensive and should illuminate interesting facts about 19th-century technology. Where sites had long use, such as on the Waitawheta River, there is good scope for resolving field remains into the different stages of the operations, but better maps are needed. Exploration of occupation sites in these fields may also cast light on the domestic lives of the miners and their families.

Railways and tramlines have a substantial archaeological presence in the Bay of Plenty, but the recording of these in the field has barely commenced. Because of the date of many of them, they are outside the scope of archaeological sites as defined in the Historic Places Act, but the evidence is, nevertheless, an important part of Bay of Plenty history. The transportation evidence is important in understanding the development history and landscape change. The economics of using tramways could be explored and the archaeological evidence compared with the known areas that were logged and their differing yields and terrain.

There has been very little archaeological study of historic settlements in the Bay of Plenty. The work at Te Wairoa buried village (Simmons 1991) is the principal exception. The older parts of Tauranga, Whakatane and Ohinemutu, and hotels along the coach routes must have greater potential than has been realised. Research questions could be framed around the Te Papa site to elucidate the layout of the missionary station and the lives of the residents (MacKay 1992). The grounds of other historic buildings, such as Athenree homestead, must hold potential for archaeology to link economic and social evidence with the historic record.

The first settler farmers in the Tauranga, Katikati and Te Puke areas must have left archaeological remains. Study of those in Tauranga may well elucidate the reason why many of the settlers were unable to keep farming their land.

Industrial archaeology also has potential in the Bay of Plenty area. Better connection needs to be made between historical industry and the present evidence for it. Some work has been done in the indigenous forestry remains, but this has rarely extended beyond specific site locations. The wider use of the countryside is a theme worth exploring further. The development of the drainage systems and the changing farm occupancy that went with that has archaeological potential. The brazen reshaping of the countryside in the kiwifruit areas has probably severely damaged evidence of past homesteads and agricultural use to the point where other areas are likely to be more rewarding of study. Elsewhere, though, the deposition of Tarawera ash over much of the coastal area after the initial colonial settlement will probably have left a marker horizon that would aid archaeological differentiation of pre- and post-Tarawera eruption settlements and land-use features.

12.3 CONSTRAINTS TO RESEARCH

Recent studies of the prehistoric archaeology of the Bay of Plenty has suffered from a lack of 'big questions' to guide research. Much of the recent archaeology carried out as a result of the requirements of the Historic Places Act seems to have lacked a clear focus on why it was being done, and the results have only rarely been related to research issues. A tiny amount of the results of this work is making its way into the conventional literature. There is no one repository of the many unpublished reports. Rather, they have to be sought from different Historic Places and Department of Conservation offices, from the Archaeological Association file, or from the authors. This is in contrast to some of the pioneering archaeological work in the Bay of Plenty, which centred on the chronology of settlement, the opportunity presented by wetland sites to expose a wider range of cultural information, and the exploration of the history of fortified sites and their place in the broader settlement pattern.

In the past, academic interest has been a stimulus to issues being explored and no doubt this will be the case again. Involvement in the region by a tertiary institution interested in an archaeological research programme would be a distinct advantage, but seems unlikely at present. The employment of soil scientists interested in archaeology and archaeologists in government conservation agencies has also been a stimulus to research. However, there are now fewer people active in these roles than at any time in the recent past. More could be achieved from the now-dominant mitigation archaeology if it was carried out within an overarching research design.

The principal constraint to historical archaeological research in the Bay of Plenty is simply that so little of the basic site recording has been done. Even where sites are recorded, the level of detail in the record is often minimal. It may be that field workers believe that because much of the development of the area is relatively recent, it may not yet have left an archaeological trace or, if present, may be of little value because of its recency. The substantial amount of archaeological work generated by development proposals concentrates mainly on the Maori sites, though there are exceptions. This concentration on Maori aspects reflects the pre-1900 definition of an archaeological site in the Historic Places Act. However, local authorities are increasingly recognising the heritage value of more recent sites in their plans. For instance, the Eastern Bay of Plenty Council plan includes several post-1900 sites. Placing lesser value on post-1900 sites constrains historical archaeology in the Bay of Plenty, because most development occurred after that time.

A lack of coherent accounts of the New Zealand Wars written from the perspective of the Bay of Plenty area may have inhibited work identifying the sites of the conflicts. Cowan (1923) provided good factual accounts of particular events, having the considerable benefit of working when these events were still within living memory of many people. However, he often failed to put the fighting in a strategic or political context. The better modern historical accounts, such as that of Belich (1988), give little space to events in the Bay of Plenty area other than those at Tauranga in 1864. A good start to the archaeology of the New Zealand Wars has certainly been made in recording sites and in the excavations reported by Spring-Rice (1983b, 1987)

and Mitchell (1984), but there is a great deal more that could be done in identifying particular historical sites, mapping them and putting known sites with little written record into their historical context.

The development of communications, land drainage, power generation and transmission, indigenous and exotic forestry, and the character of early industries and farmsteads all offer opportunities for archaeological research. For example, was there an Irish character to the farmsteads of the Ulster settlers?

As is noted in Appendix 1, there are areas of the Bay of Plenty region that appear to have been under-surveyed in terms of locating both prehistoric and historic sites. Since these areas tend to be remote from the coast, they will generally have lower concentrations of Maori sites than coastal areas, making fieldwork less rewarding in terms of sites found. There are considerable opportunities for research in historical archaeology. The basic fieldwork does not need an academic base, only application in the field.

13. Acknowledgements

This research was funded by the Department of Conservation (Science Investigation No. 3468). The author's thanks are extended to the NZAA site record file keepers, the researchers in the area who made unpublished records available, and the staff of the Research, Development & Improvement Division, Department of Conservation, who offered comment and advice.

14. References

- Ambrose, W. n.d.: Kauri Point. Unpublished manuscript presented at New Zealand Archaeological Association Conference, New Plymouth.
- Ambrose, W. 1961: Rock carvings at Ongari Point. *New Zealand Archaeological Association Newsletter* 4(2): 49-50.
- Ambrose, W. 1962: Further Investigations at Kauri Point. *New Zealand Archaeological Association Newsletter* 5(1): 56-67.
- Ambrose, W. 1967: Kauri Point. Unpublished manuscript presented at NZAA Conference, New Plymouth.
- Andersen, J.C.; Petersen, G.C. 1956: The Mair family. A.H. and A.W Reed, Wellington.
- Andrews, P. 1990: Report on a midden from the Ohinemutu Hotel Rotorua. Unpublished report. Copy held in Bay of Plenty Conservancy Office library, Department of Conservation, Rotorua.
- Andrews, P. 2001: No fear of rusting, a biography of the Rev. Thomas Chapman. Rotorua and District Historical Society, Rotorua.
- Angus & Associates Ltd 2007: Regional visitor monitor (results to September 2007). National benchmark report. Prepared for Ministry of Tourism, Wellington.

- Annabell, R. 1977: Hot water country. Reed, Wellington.
- Anon. n.d.a: Okataina scenic reserve cultural history. www.doc.govt.nz/upload26537/Lake-Okataina-Scenic-Reserve-cultural-history.pdf (viewed June 2008).
- Anon. n.d.b: Tsunami Hazard for the Bay of Plenty and Eastern Coromandel Peninsula: Stage 1. Environment Waikato Report TR04/33, prepared by Geoenvironmental Consultants.
- Anon. 1981: Guide to the Wairongomai Valley. New Zealand Forest Service, Wellington.
- Anon. 1985: Notes and news. *New Zealand Archaeological Association Newsletter* 28(3): 134–143.
- Anon. 1988: Glimpses from Whakatane's past. *Monograph 18*. Whakatane and District Historical Society.
- Anon. 1992: Guide to the Waiorongomai Valley, Kaimai-Mamaku Forest Park. Leaflet, Department of Conservation.
- Anon. 1993: Ditch and bank construction Uruturituri Pa Area III Matakana Island. University of Auckland Field School, Matakana Island, Bay of Plenty, 1993. Department of Anthropology, University of Auckland, Auckland (unpublished).
- Anon. 1999: Register of actively managed historic places, Bay of Plenty Conservancy. Department of Conservation (unpublished).
- Anon. 2003: Deed of settlement between the Crown and Ngati Awa. www.beehive.govt.nz/ViewDocument.cfm?DocumentID=16344 (viewed June 2008).
- Ballara, A. 2003: Taua, 'musket wars', 'land wars' or tikanga? Warfare in Maori society in the early nineteenth century. Penguin Books, Auckland.
- Beard, J.G.; Ragheb, M.G. 1980: Measuring Leisure Satisfaction. *Journal of Leisure Research* 12(1): 20–33.
- Becken, S.; Lennox, J.; Fitt, H.; Butcher, G. 2007: Summary report of the Yield Research Programme November 2007. Christchurch: Tourism Research and Education Centre, Lincoln University.
- Belich, J. 1988: The New Zealand wars and the Victorian interpretation of racial conflict. Penguin Books, Auckland.
- Bell, R.G.; Goff, J.; Downes, G.; Berryman, K.; Walters, R.A.; Chagué-Goff, C.; Barnes, P.; Wright, I. 2004: Tsunami hazard for the Bay of Plenty and Eastern Coromandel Peninsula: Stage 2. Environment Waikato Report: TR04/32.
- Bellamy, A.C. 1982: Tauranga, 1882–1982. Tauranga City Council, Tauranga.
- Bellamy, A.C. 1991: First in fertiliser, a history of the Bay of Plenty Co-operative Fertiliser Company Limited. The Company, Tauranga.
- Best, E. 1922a: Some aspects of Maori myth and religion. *Dominion Museum Monograph No 1*. Government Printer, Wellington.
- Best, E. 1922b: Spiritual and mental concepts of the Maori. *Dominion Museum Monograph No 2*. Government Printer, Wellington.
- Best, E. 1924: The Maori as he was. Third impression, 1952. Government Printer, Wellington.
- Best, E. 1925: Tuhoe, the children of the mist. 2 Vols. Board of Maori Ethnological Research, New Plymouth.
- Best, E. 1928: Maori and maruiwi. The arrival of the first Polynesian settlers at Whakatane. Origin of the mixed Toi Tribes. *Journal of the Polynesian Society* 37: 175–225.
- Best, E. 1942: The forest lore of the Maori. *Bulletin Number 14*. Dominion Museum, Wellington.
- Binney, J. 1995: Redemption songs, a life of Te Kooti Arikirangi Te Turuki. Auckland University Press, Auckland.
- Blake-Palmer, G. 1947: New Zealand archaeology and air photography. *Journal of the Polynesian Society* 56(3): 233–241.

- Boileau, J. 1978: Wood from Kohika, a study of exploitation and wood-working technology. Unpublished M.A. Research Essay, University of Auckland.
- Bowers, L.C. 1992: Bay of Plenty shipwrecks 1840–1900. *Miscellaneous Report Series No. 14*. Bay of Plenty Conservancy, Department of Conservation.
- Bowers, L.C. 1995: Conservation plan: Te Irihangā Pa. Unpublished report prepared for Te Mahau 1 and Te Irihangā 2 Trust.
- Bowers, L.C. 1996: Archaeological investigation report, pursuant to an authority under Section 14 of the Historic Places Act 1993. No 1996/76: (U14/677) Wairoa, Western Bay of Plenty. Unpublished report prepared for George Evans.
- Bowers, L.C.; Jones, K. 1991: Tauwhare Pa archaeological investigation and site restoration. *Bay of Plenty Conservancy Technical Report Series No. 9*. Department of Conservation.
- Bowers, L.C.; Phillips, K. 1997a: Archaeological investigation report, pursuant to an authority under Section 14 of the Historic Places Act 1993 (No. 1995/30) Te Horo Drive, Ohope Beach, Bay of Plenty. Unpublished report, Historic Resource Management Services.
- Bowers, L.C.; Phillips, K. 1997b: Archaeological investigation report pursuant to authority under Section 14 of the Historic Places Act 1993, No. 1997/44, 26–28 Sixth Avenue Tauranga, Bay of Plenty, Part 1, U14/519 (Historic). Historic Resource Management Services.
- Bowers, L.C.; Phillips, K. 1997c: Archaeological investigation report pursuant to authority under Section 14 of the Historic Places Act, No. 1997/30 Omataroa Forest Eastern Bay of Plenty. Unpublished report, Historic Resource Management Services.
- Bowers, L.C.; Phillips, K. 1997d: Archaeological investigation report pursuant to an authority under Section 14 of the Historic Places Act, No. 1997/33, Omataroa Forest, Eastern Bay of Plenty. Unpublished report, Historic Resource Management Services.
- Bowers, L.C.; Phillips, K. 1997e: Archaeological investigation report pursuant to an authority under Section 14 of the Historic Places Act, No. 1997/50. 115 Fourth Ave, Tauranga, Bay of Plenty. Unpublished report, Historic Resource Management Services.
- Bowers, L.C.; Phillips, K. 1998: Archaeological investigation report pursuant to authority under Section 14 of the Historic Places Act, No. 1996/91, Reid Rd, Papamoa. Historic Resource Management Services.
- Boyd, J. n.d.: Pumice and pines, the story of Kaingaroa Forest. GP Publications.
- Boyd, S. 2002: Cultural and heritage tourism in Canada: opportunities, principles and challenges. *Tourism and Hospitality Research* 3: 211.
- Buck, C.E.; Hingham, T.F.G.; Lowe, D.J. 2003: Bayesian tools for tephrochronology. *The Holocene* 13(5): 639–647.
- Buck, P. 1921: Maori food supplies of Lake Rotorua. *Transactions of the New Zealand Institute* 53: 433–451.
- Campbell, M. 2004: Excavation of site U14/1945, Oropi Valley, Tauranga. *Archaeology in New Zealand* 47(1): 50–61.
- Campbell, M. 2005: The archaeology of kakahi (*Hyridella menziesi*). *Archaeology in New Zealand* 48(2): 101–112.
- Cave, J. 2002: Partners and relationships. Unpublished report prepared for the Tauranga District Council.
- Cave, J.; Ryan, C.; Panakera, C. 2003: Residents' perceptions, migrant groups and culture as an attraction—the case of a proposed Pacific Island cultural centre in New Zealand. *Journal of Tourism Management* 43(4): 371–385.
- Clarkson, B.D. 1991: Coastal plants inland. Pp. 93–96 in Clarkson, B.D.; Smale, M.C.; Enroyd, C.E. (Eds): Botany of Rotorua. Forest Research Institute, Rotorua.
- Clarkson, B.P.C.; Clarkson, B.R. 1991: A century of change on Mt Tarawera. Pp. 13–84 in Clarkson, B.D.; Smale, M.C.; Enroyd, C.E. (Eds): Botany of Rotorua. Forest Research Institute, Rotorua.

- Collier, A.J. 1999: Principles of tourism: a New Zealand perspective. Addison Wesley Longman, Auckland.
- Coster, J. 1977: A rua in the Kaimais: excavation report. *New Zealand Archaeological Association Newsletter* 20(4): 244–250.
- Coster, J. 1989: Dates for the dunes: a sequence for the Aupouri Peninsula, Northland, New Zealand. *New Zealand Journal of Archaeology* 11: 51–75.
- Coster, J.; Johnston, G. 1980: Interim report investigation of archaeological sites N57/73-75, Michaels Block, Waihou Valley Scheme. New Zealand Forest Services AK file 6/201/21/1 (unpublished).
- Cotching, W.E. 1998: Soil survey of the Te Puke District, Bay of Plenty, New Zealand. Landcare Research Technical Record. Manaaki Whenua-Landcare Research New Zealand, Hamilton.
- Cowan, J. 1923: The New Zealand Wars. A history of the Maori campaigns and the pioneering period. 2 Vols. Government Printer, Wellington.
- Cowan, J. 1935: A trader in a cannibal land. The life and adventures of Captain Tapsell. A.H. and A.W. Reed, Wellington.
- Crosby, R. 2004: Gilbert Mair, Te Kooti's nemesis. Reed, Auckland.
- Cultural Tourism Working Party 2000: Cultural tourism. Evidence in preparation for Tourism Strategy 2010. Creative New Zealand, Wellington.
- Davis, F.W. 1958: Petroglyphs in Kaingaroa Block—the Murapara rock carvings. *Historical Review* 6(1): 2–6.
- Diamond, J.T.; Hayward, B.W. n.d.: Kauri timber dams. Lodestar Press.
- Diamond, P. 2007: Makereti: taking Maori to the world. Random House.
- Dieffenbach, E. 1843: Travels in New Zealand with contributions to the geography, geology, botany and natural history of that country. 2 vols. John Murray, London.
- Downey, J.F. 1935: Gold mines of the Hauraki District. Government Printer, Wellington.
- Dunn, M. 1985: John Kinder: paintings and photographs. Seto Publishing, Auckland.
- Edson, S.C. 1973: Human ecology and prehistoric settlement on some offshore islands (East Cape to Cape Reinga, New Zealand). Unpublished MA thesis, University of Auckland.
- Ellison, N.H. 1956: The Whirinaki Valley. Pauls Book Arcade, Hamilton.
- Firth, R.W. 1929: Primitive economics of the New Zealand Maori. Routledge, London.
- Fletcher, P.T. 2002: Ngati Tahu—Ngati Whaoa social and cultural report on Te Awa O Waikato. Unpublished report for Mighty River Power.
- Fredricksen, C.; Barber, I.; Best, S. 1995: Pre-European occupation on the Papamoa dune ridges. The archaeological investigating of site U14/2841, L.S Johnson Trust property. Archaeological Heritage Consultants, Auckland. Unpublished report for the New Zealand Historic Places Trust.
- Fredricksen, C.; Kahotea, D.T.; Felgate, M. 1996: An archaeological survey of the Papamoa Coastal Zone, Tauranga District. Unpublished report.
- Froggatt, P. 1994: Identification or tephra (volcanic ash) layers in archaeological survey sites on Matakana Island. Unpublished report for Uniservices, Victoria University Research Ltd., Wellington.
- Fulton, R. 1921: An account of a supposed Maori sharpening stone. *Transactions of the New Zealand Institute* 53: 471–472.
- Furey, L. 1981: Excavation of Site N77/606, Long Valley Kawerau: an interim report. Department of Anthropology, University of Auckland (unpublished).
- Furey, L. 1983: Maruka investigation, Kawerau, Bay of Plenty, final report for Stage III. Department of Anthropology, University of Auckland.

- Furey, L. 1996: Oruarangi, the archaeology and material culture of a Hauraki Pa. *Bulletin No. 17 of the Auckland Institute and Museum*.
- Gardner, E.F.P. 1993: A summary of the Tauranga County archaeological material located in the Auckland Institute and Museum. Unpublished research project, Department of Anthropology, University of Auckland.
- Gibbons, W.H. 1990: The Rangitaiki 1890–1990. Settlement and drainage on the Rangitaiki. *Whakatane and District Historical Society Monograph 20*.
- Goff, J.; Walters, R.; Callaghan, F. 2006: Tsunami Source Study. Environment Waikato Report TR 2006/49.
- Golson, J. 1959: The Excavations at Paengoroa, 20–21 May, 1959. *Historical Review 7(4)*:82–84.
- Golson, J. 1960: Excavations at Pakotore, Paengoroa, Bay of Plenty. *New Zealand Archaeological Association Newsletter 3(2)*: 11–14, 20.
- Golson, J. 1961a: Investigations at Kauri Point, Katikati, western Bay of Plenty: conclusions and hypotheses. *New Zealand Archaeological Association Newsletter 4(2)*: 38–41.
- Golson, J. 1961b: Investigations at Kauri Point, Katikati, western Bay of Plenty: introduction. *New Zealand Archaeological Association Newsletter 4(2)*: 13–15.
- Golson, J. 1961c: Investigations at Kauri Point, Katikati, western Bay of Plenty: the excavation. *New Zealand Archaeological Association Newsletter 4(2)*: 17–29.
- Golson, J.; Stafford, D.M. 1959: Rotorua—Bay of Plenty. *New Zealand Archaeological Association Newsletter 2(2)*: 29–30.
- Grace, D. 2004: A driven man. Missionary Thomas Samuel Grace 1815–1979: his life and letters. Ngaio Press, Wellington.
- Grace, J. Te H. 1959: Tuwharetoa, the history of the Maori people of the Taupo district. A.H and A.W. Reed, Wellington.
- Grace, R. 1982: A drowned pa in Lake Okataina. *New Zealand Archaeological Association Newsletter 25(4)*: 247–251.
- Grant, P.J. 1985: Major periods of erosion and alluvium sedimentation in New Zealand during the late Holocene. *Journal of the Royal Society of New Zealand 15(10)*: 57–121.
- Grant, P.J. 1996: Hawkes Bay forests of yesterday. Privately published, Havelock North. 273 p.
- Gray, A.J. 1950: An Ulster plantation. 2nd Edition. A.H. and A.W. Reed, Wellington.
- Green, R.C. 1963a: Review of the prehistoric sequence of the Auckland Province. *New Zealand Archaeological Association Monograph 2*.
- Green, R.C. 1963b: An undefended settlement at Kauri Point, Tauranga District. *Historical Review 11(3)*: 143–156.
- Green, R.C. 1964: An undefended settlement at Kauri Point, Tauranga District. *New Zealand Archaeological Association Newsletter 7(1)*: 11–17.
- Green, R.C. 1978: Dating the Kauri Point sequence. *Historic Review 26(1)*: 32–45.
- Gregg, D.R. 1956: Maori rock drawings at Lake Tarawera. *Journal of the Polynesian Society 65*: 364–366.
- Grey, G. 1855: Polynesian mythology. J. Murray, London.
- Groube, L.M. 1970: The origin and development of earthwork fortifications in the pacific. Pp. 133–164 in Green, R.C.; Kelly, M. (Eds): Studies in oceanic culture history, Vol 1. *Pacific Anthropological Records No. 11*. B.P. Bishop Museum.
- Grouden, V.J. 1991: Te Kauri Village. A report on authority 1990/64 to modify an archaeological site. *Bay of Plenty Conservancy Technical Report Series No. 7*. Department of Conservation.
- Grouden, V.J. 1993a: Kaimai-Mamaku Forest Park. Historic Resources Inventory. *Bay of Plenty Conservancy Technical Report Series No. 19*. Department of Conservation.

- Grouden, V.J. 1993b: Matata and Ohope Scenic Reserves Historic Resources Inventory. Department of Conservation, Rotorua (unpublished).
- Grouden, V.J. 1995: Archaeological assessment report to determine the extent of damage to NZAA site W15/90 by home sites excavation. Unpublished report. Copy held by New Zealand Archaeological Association (Bay of Plenty site record file).
- Gumbley, W. 1997: Archaeology of pre-European garden soils at Papamoa, Bay Of Plenty. Unpublished report for Bay of Plenty Conservancy, Department of Conservation.
- Gumbley, W. 2004: Archaeological investigations of the defences of a pa at Papamoa. Unpublished report prepared for Fulton Logan Ltd.
- Gumbley, W.; McFadgen, B.G. 1995: LS Johnson Trust residential subdivision, Papamoa: report on the preliminary archaeological investigation 3 July to 7 July 1995. Unpublished report for New Zealand Historic Places Trust.
- Gumbley, W.; Phillips, K.J. 2000: Papamoa lowlands archaeological survey and heritage assessment urban growth study Papamoa. Unpublished report for Tauranga District Council.
- Gumbley, W.; Phillips, K.J. 2004: U14/3113 and U14/3116. Unpublished report on archaeological investigations, Papamoa, Bay of Plenty.
- Hall, N.V. 1981: 'I have planted' a biography of Alfred Nesbit Brown. Dunmore Press, Palmerston North.
- Hamilton, H. 1925: The Kaingaroa Carvings. *Journal of the Polynesian Society* 34(1): 358–362.
- Hansen, N.G. 1997: History of Tauranga Harbour and port. Privately published.
- Hargreaves, R.P. 1959: The Maori agriculture of Auckland Province in the mid-nineteenth century. *Journal of the Polynesian Society* 68: 61–79.
- Hargreaves, R.P. 1961: Maori flour mills of the Auckland Province 1846–60. *Journal of the Polynesian Society* 70: 227–232.
- Healy, B. 1982: A hundred million trees, the story of N.Z. Forest Products. Hodder and Stoughton, Auckland.
- Healy, J. 1978: Beach erosion at Waihi Beach. *New Zealand Journal of Marine and Freshwater Research* 12(2): 99–107.
- Heath, E.; McLean, G. 1994: Shipwrecks around New Zealand. Grantham House, Wellington.
- Henderson, G.M. 1948: The antecedents and early life of Valentine Savage, known as Taina. Wingfield Press, Wellington.
- Higham, T.F.G.; Hogg, A.G.; Lowe, D.J.; Palmer, J.; Reimer, P.; Nairn, I. 2000: Precise wiggle-match dating of the Kaharoa tephra. *Geological Society of New Zealand Miscellaneous Publications* 108: 74.
- Higham, T.F.G.; Hogg, A.G.; Lowe, D.J.; Palmer, J.; Reimer, P.; Nairn, I. 2001: Precise age for the c. 650 Kaharoa tephra using 'wiggle-match' dating. Australasian Archaeometry Conference 2001. Australasian Connections and New Directions, Auckland, February 5–9, 2001: 33.
- Hochstetter, F. von 1867: New Zealand: its physical geography, geology and natural history. Cotta.
- Hodgson, K.A.; Nairn, I.A. 2000: The catastrophic ~ 1350AD post-eruption flood from Lake Tarawera, New Zealand. Resource Planning Report 2000/01, Environment Bay of Plenty, Whakatane.
- Hodgson, K.A.; Nairn, I.A. 2005: The c. AD 1315 syn-eruption and AD 1904 post-eruption breakout floods from Lake Tarawera, Haroharo caldera, North Island New Zealand. *N.Z. Journal of Geology and Geophysics* 48: 491–506.
- Hogg, A.G.; Higham, T.G.F.; Lowe, D.J.; Palmer, J.G.; Reimer, P.J.; Newman, R.M. 2003: A wiggle-match date for Polynesian settlement of New Zealand. *Antiquity* 77: 116–125.
- Holdaway, S.J. 2004: The Kohika obsidian artefacts: technology and distribution. Pp. 177–197 in Irwin, G.J. 2004: Kohika. The archaeology of a late Maori lake village in the Ngati Awa rohe, Bay of Plenty, New Zealand. Auckland University Press, Auckland.

- Holroyd, S. n.d.: Obsidian sources of the North Island, location and identifying characteristics. Unpublished M.A. research essay, University of Auckland, Auckland.
- Hooker, R.H. n.d.: Papamoa dunes: garden of Eden or ferae naturae? Unpublished research paper.
- Hooker, R.H. 1995: Initial report on mitigation investigation for Angus Developments, Papamoa. Unpublished report prepared by Arcsearch for New Zealand Historic Places Trust.
- Hooker, R.H. 1998a: Report of archaeological investigation of shell midden sites U14/2846 and 2847 at Evansfield subdivision, Evans Road, Papamoa. Unpublished report prepared for NZ Historic Places Trust, Wellington.
- Hooker, R.H. 1998b: Report on archaeological investigation at sites U14/1721, 2833-2887 Summerlands Estate subdivision, Papamoa. Unpublished report.
- Hooker, R.H. 1998c: Report on archaeological investigation of shell midden site U14/526, Pacific Cove subdivision, Domain Road, Papamoa, November 1998. Unpublished report prepared for NZ Historic Places Trust.
- Hooker, R.H. 1998d: Report on archaeological investigation of sites U14/1711, 1712, 1713, 2820, 2893 and 2894, Te Parewaitai Estates subdivision, Grenada Street, Papamoa. Unpublished report prepared for NZ Historic Places Trust.
- Hooker, R.H. 1998e: Report on investigation of sites U14/1712 and 2820, Te Parewaitai Estates subdivision, Grenada Street, Papamoa. Unpublished report.
- Hooker, R.H. 1998f: Report on Investigation Site U14/2246, D and A Cranna Property, 1132 Ohauiti Road, Welcome Bay. Under Historic Places Trust 1993, Authority 1998/94. Unpublished report.
- Hooker, R.H. 1999a: Report on archaeological investigation at Papamoa 7B Block, Te Hana, Mount View subdivision, Range Road, Papamoa. HPT Authority on behalf of Waimea Consulting. Unpublished report.
- Hooker, R.H. 1999b: Report on archaeological investigation at Te Kuia Parewaitai subdivision, Grenada Street, Papamoa. HPT Authority 1998/87. Unpublished report prepared for NZ Historic Places Trust on behalf of Parewaitai Estates, Ltd, Papamoa.
- Hooker, R.H. 1999c: Report on archaeological investigation at Watene Property, Waikite Road subdivision, Welcome Bay. Unpublished report (interim) prepared for NZ Historic Places Trust.
- Hooker, R.H. 2000a: Report on archaeological investigation at Grand View Estate subdivision, Waikite Road, Welcome Bay, Tauranga. Under Historic Places Act 1993 Authority 1998/70. Unpublished report.
- Hooker, R.H. 2000b: Report on archaeological investigation site U15/642, F Larsen Property, 1 Maungarangi Road, Paengaroa. Under Historic Places Act 1993, Authority 9900/35. Unpublished report.
- Hooker, R.H. 2000c: Report on investigation of terrace site U14/2027 estates terrace Welcome Bay. Unpublished report prepared for NZ Historic Places Trust under HPT Authority 9900/104 D. and Y. Couch Property.
- Hooker, R.H. 2001: Report on archaeological investigation at Papamoa 4A/1 Block, Seacrest Resort, Papamoa Beach Rd Papamoa, HPT Authority 9900/66. Unpublished report prepared for Seacrest Resort.
- Horrocks, M.; Campbell, M.; Gumbley, W. 2007: A short note on starch and xylem of *Ipomoea batatas* (sweet potato) in archaeological deposits for northern New Zealand. *Journal of Archaeological Science* 34: 1441-1448.
- Horrocks, M.; Irwin, G.G.; Jones, M.; Sutton, D. 2004: Starch grains and xylem cells of sweet potato (*Ipomoea batatas*) and bracken (*Pteridium esculentum*) in archaeological deposits from northern New Zealand. *Journal of Archaeological Science* 31: 251-258.
- Houghton, B.F.; Weaver, S.D.; Wilson, C.J.N.; Lanphere, M.A. 1992: Evolution of a Quaternary peralkaline volcano: Mayor Island, New Zealand. *Journal of Volcanology & Geothermal Research* 51: 217-236.

- Ingram, C.W.N. 1972: Shipwrecks, 1979–1975. A.H. and A.W. Reed, Wellington.
- Irwin, G.J. 1975: The Kohika Site; Bay of Plenty. *Historical Review* 23(2): 101–104.
- Irwin, G.J. (Ed.) 2004: Kohika. The archaeology of a late Maori lake village in the Ngati Awa rohe, Bay of Plenty, New Zealand. Auckland University Press, Auckland.
- Irwin, G.J.; Jones, M.D. 2004: Site chronology. Pp. 76–82 in Irwin, G.J. 2004: Kohika. The archaeology of a late Maori lake village in the Ngati Awa rohe, Bay of Plenty, New Zealand. Auckland University Press, Auckland.
- Irwin, G.J.; Nichol, R.K.; Taylor, M.A.; Worthy, T.H.; Smith, I.W.G. 2004: Faunal remains from Kohika. Pp. 198–216 in Irwin, G.J. 2004: Kohika. The archaeology of a late Maori lake village in the Ngati Awa rohe, Bay of Plenty, New Zealand. Auckland University Press, Auckland.
- Irwin, G.J.; Wallace, R.; Green, S. 2007: An archaeological collection of gourd artefacts from the Kohika lake village. Pp. 43–52 in Anderson, A.J.; Green, K.; Leach B.F. (Eds): 2007: Vastly ingenious; the archaeology of pacific material culture in honour of Janet M Davidson. Otago University Press, Dunedin.
- Johnson, N.; Calcott, J. 1967: Underwater pa, Lake Okataina. *Dive South Pacific Underwater Magazine* 6(5): 14–16.
- Jones, K.L. 1983a: Moerangi: a fortification of the Tauranga Bush Campaign 1867. Pp. 65–76 in Bulmer, S.; Law, G.; Sutton, D. (Eds): A lot of spadework to be done, essays in honour of Lady Aileen Fox. *New Zealand Archaeological Association Monograph No. 14*.
- Jones, K.L. 1983b: Pa in two western segments of the Waiotahi and Whakatane Valleys, Bay of Plenty. *New Zealand Archaeological Association Newsletter* 26(3): 165–173.
- Jones, K.L. 1984a: Archaeological investigations in Waiotahi Valley, Bay of Plenty, November 1981. *New Zealand Archaeological Association Newsletter* 27(2): 109–118.
- Jones, K.L. 1984b: A wharepuni in the Whirinaki State Forest: report on excavations at N95/32. *New Zealand Archaeological Association Newsletter* 27(4): 247–255.
- Jones, K.L. 1986: Polynesian settlement and horticulture in two river catchments of the eastern North Island, New Zealand. *New Zealand Journal of Archaeology* 8: 5–31.
- Jones, K.L. 1991: Maori settlement and horticulture on Rangitaiki Plains, Bay of Plenty, New Zealand. *New Zealand Journal of Archaeology* 13: 143–175.
- Jones, M.D. 1994: Matakana and related obsidian hydration dates. Appendix 2 in Sutton, D.G. 1994: Maps of archaeological sites Matakana Island and 1993–94 Annual Report. Report to the Science and Research Division, Department of Conservation, Wellington.
- Kahotea, D.T. 1983: The interaction of Tauranga hapu with the landscape. Unpublished M.A. thesis, University of Auckland, Auckland.
- Kahotea, D.T. 1988: Tupakaria site U15/35, Rotorua. Unpublished interim report for the Science Directorate, Department of Conservation.
- Kahotea, D.T. 1992: Tauranga urban growth strategy. Cultural resource inventory. Features of significance to the Maori community (tangata whenua). Unpublished report prepared for the Trust Tauranga, Tauranga District Council.
- Kahotea, D.T. 1993: Papamoa main drain outlet. Archaeological investigation of Grant Place stormwater pipeline. Foredune route. Unpublished report.
- Kelly, J. 2003: An investigation into retail as a tourist activity using Mount Maunganui as a case example. Unpublished report submitted in partial fulfilment of the requirements of the Degree of Bachelor of Management Studies, University of Waikato, Hamilton.
- Keyes, I.W.; Matheson, I.R. 1970: A large worked nephrite slab from the northern Ahimanawa Range. *Journal of the Polynesian Society* 79(4): 433–436.
- King, J. 1995: New Zealand tragedies, aviation accidents and disasters. Grantham House, New Zealand.
- Kingsley-Smith, C. 1971: Te Paripari, a gunfighters pa, Ohope. *Historical Review* 19(2): 135–136.

- Ladefoged, T.N.; McLachlan, S.M.; Ross, S.C.L.; Sheppard, P.J.; Sutton, D.G. 1995: GIS-based image enhancement of conductivity and magnetic susceptibility data from Urururituri Pa and Fort Resolution, New Zealand. *American Antiquity* 60(3): 471–481.
- Latter, J.H.; Lloyd, E.F.; Smith, I.E.M.; Nathan, S. 1992: Volcanic hazards in the Kermadec Islands, and at submarine volcanoes between southern Tonga and New Zealand. *New Zealand Ministry of Civil defence, Volcanic Hazards Information Series No. 4*.
- Law, R.G. 1969: Some petroglyph sites in the North Island, New Zealand. *New Zealand Archaeological Association Newsletter* 12(4): 191–198.
- Law, R.G. 1973: Tokoroa moa-hunter site. *New Zealand Archaeological Association Newsletter* 16(4): 150–164.
- Law, R.G. 1982: Coromandel Peninsula and Great Barrier Island. Pp. 49–61 in Prickett, N. (Ed.) 1982: The first thousand years, regional perspectives in New Zealand archaeology. Dunmore Press, Palmerston North.
- Law, R.G. 1984: Review of McFadgen and Sheppard, Ruahihi pa. *New Zealand Archaeological Association Newsletter* 27(3): 191–194.
- Law, R.G. 1999: Pits long, large and prestigious: recognition of varieties of Maori kumara storage pits in northern New Zealand. *New Zealand Journal of Archaeology* 21: 29–45.
- Law, R.G. 2002a: Bay of Plenty archaeological resource statement, first report—site survey review. Unpublished report filed with New Zealand Archaeological Association Central File, Research, Development & Improvement Division, Department of Conservation, Wellington.
- Law, R.G. 2002b: Bay of Plenty archaeological resource statement, second report—excavated sites. Unpublished report filed with New Zealand Archaeological Association Central File, Research, Development & Improvement Division, Department of Conservation, Wellington.
- Lawlor, I. 1975: The Kohika Site, Bay of Plenty. *Historical Review* 13(2): 101–104.
- Lawlor, I. 1979: Paleoenvironment analysis: an appraisal of the prehistoric environment of the Kohika Swamp Pa (N68/140), Bay of Plenty. Unpublished M.A. thesis, University of Auckland, Auckland.
- Lawlor, I. 1981: Maruka excavations, Kawerau, 1981: an interim report. *New Zealand Archaeological Association Newsletter* 24(3): 184–191.
- Lawlor, I. 1983a: Drowned pa in Lake Okataina. *New Zealand Archaeological Association Newsletter* 26(1): 74–75.
- Lawlor, I. 1983b: Rua kumara o Kawerau. Pp. 212–248 in Bulmer, S.; Law, G.; Sutton, D. (Eds): A lot of spadework to be done, essays in honour of Lady Aileen Fox. *New Zealand Archaeological Association Monograph No. 14*.
- Leach, B.F.; Davidson, J.M.; Horwood, L.M. 1994: Identification of archaeological fish bones from Matakanā Island. Museum of New Zealand Te Papa Tongarewa Technical Report (unpublished).
- Leach, B.F.; de Souza, P. 1979: The changing proportions of Mayor Island obsidian in New Zealand prehistory. *New Zealand Journal of Archaeology* 1: 29–51.
- Leach, H. 1983: An unusual and previously unrecorded stone reel from Whakatane. Pp. 173–183 in Bulmer, S.; Law, G.; Sutton, D. (Eds): A lot of spadework to be done, essays in honour of Lady Aileen Fox. *New Zealand Archaeological Association Monograph No. 14*.
- Leahy, A. 1976: Whakamoenga cave, Taupo, N94/7. *Records of the Auckland Institute and Museum* 13: 29–75.
- Leamy, M.L.; Fieldes, M. 1976: Soil, classification and use. Pp. 122–133 in Wards, I. (Ed.) 1976: New Zealand atlas. Government Printer, Wellington.
- Leathwick, J.R. 2000: Predictive models of archaeological site distributions in New Zealand. *Science & Research Internal Report 181*. Department of Conservation, Wellington.
- Lloyd, E.F.; Nathan, S.; Smith, I.E.M.; Stewart, R.B. 1996: Volcanic history of Macauley Island, Kermadec Ridge, New Zealand. *New Zealand Journal of Geology and Geophysics* 39: 295–308.

- Lockstone, B.; Harrison, P. 2000: DC3, southern skies pioneer. Random House, Auckland.
- Lousberg, M. 2005: Communities in conflict: the government and the eastern districts 1842–1845. Pp. 57–72 in Ballantyne, T.; Bennett, J.A. (Eds): Landscape/community perspectives from New Zealand. Otago University Press, Dunedin.
- Lowe, D.J.; Newham, R.M.; McCraw, J.D. 2002: Volcanism and early Maori society in New Zealand. Pp. 126–161 in Torrance, R.; Gratan, J. (Eds): Natural disasters and cultural change. Routledge, London.
- Lowe, D.J.; Newnham, R.M.; McFadgen, B.G.; Higham, T.F.G. 2000: Tephra and archaeology in New Zealand. *Journal of Archaeological Science* 27: 859–870.
- Lyall, A.C. 1979: Whakatohea of Opotiki. Reed, Wellington.
- Mabon, A.D. 1961: Karearea Pa. *Historical Review* 9(2): 50–53.
- Mabon, A.D.; Pullar, W.A. 1963a: Tuanui Pa, Taneatua, Bay of Plenty. *Historical Review* 11(3): 157–161.
- Mabon, A.D.; Pullar, W.A. 1963b: Tauanui Pa, Whakatane. *New Zealand Archaeological Association Newsletter* 6(2): 103–106.
- MacKay, J. 1992: The Elms mission station conservation Area, Tauranga. New Zealand Historic Places Trust (unpublished).
- MacKay, J. 1993: Te Aroha hot springs domain conservation Area, Te Aroha, New Zealand. New Zealand Historic Places Trust (unpublished).
- Mahoney, P. 1998: The era of the bush tram in New Zealand. IPL Books.
- Mair, G. 1902: Chips from an ancient Maori workshop. *Transactions of the New Zealand Institute* 35: 240–242.
- Mandeno, W. 1975: Lloyd Mandeno OBE, 1888–1973. Privately published.
- Marshall, Y.M.; Paama, M.; Samuels, M.; Sutton, D.G.; Taikato, T. 1993a: Archaeological survey of Matakana Island, forest compartment 12 stands 1–5; compartment 14, stand 2: preliminary report. Unpublished Uniservices Report for ITT Rayonier.
- Marshall, Y.M.; Paama, M.; Samuels, M.; Sutton, D.G.; Taikato, T. 1993b: Archaeological survey of Matakana Island, forest compartment 20 stands 2, 3, 4 & 5: preliminary report. Unpublished Uniservices Report for ITT Rayonier.
- Marshall, Y.M.; Paama, M.; Samuels, M.; Sutton, D.G.; Taikato, T. 1994a: Archaeological survey of Matakana Island, forest compartment 3, stands 2–4; compartment 12, stands 1–5, compartment 14, stand 2; and compartment 20 stands 1–5 final report. Unpublished Uniservices Report for ITT Rayonier.
- Marshall, Y.M.; Paama, M.; Samuels, M.; Sutton, D.G.; Taikato, T. 1994b: Archaeological survey of Matakana Island, forest compartment 3, stands 2–4: final report. Unpublished Uniservices Report for ITT Rayonier.
- Matheson, A.H. 1979: Motiti Island, Bay of Plenty. *Whakatane and District Historical Society, Monograph No. 2*. Tauranga.
- Matheson, A.H. 1999: Bay of Plenty shipwrecks, corrections and additions. *Historical Review* 47(2): 77–81.
- McElvey, P.J. 1958: Forest history and New Zealand prehistory. *New Zealand Science Review* 16(3–4): 28–32.
- McFadgen, B.G. 1977: Location of Maori defences at Te Ranga battle site near Tauranga, determined by geophysical prospecting methods. *New Zealand Archaeological Association Newsletter* 20(4): 251–255.
- McFadgen, B.G. 1981: Report on the threat to archaeological sites in Tauranga County. New Zealand Historic Places Trust (unpublished).
- McFadgen, B.G. 1982: A summary of archaeological investigations at Athenree, Western Bay of Plenty. New Zealand Historic Places Trust (unpublished).

- McFadgen, B.G. 1985a: Late Holocene stratigraphy of coastal deposits between Auckland and Dunedin, New Zealand. *Journal of the Royal Society of New Zealand* 15(1): 27–65.
- McFadgen, B.G. 1985b: Report on the archaeological investigation of Site U14/2240 Tauranga City. New Zealand Historic Places Trust (unpublished).
- McFadgen, B.G. 2007: Hostile shores: catastrophic events in prehistoric New Zealand and their impact on Maori coastal communities. Auckland University Press, Auckland.
- McFadgen, B.G.; Sheppard, R.A. 1984: Ruahiri Pa—A prehistoric defended settlement in the south-western Bay of Plenty. *National Museum of New Zealand Bulletin* 22; *New Zealand Historic Places Trust Publication* 19.
- McFadgen, B.G.; Walton, A.J. 1981: Report of archaeological survey of Matakana and Rangiwaea Islands, Bay of Plenty. Unpublished report to New Zealand Historic Places Trust.
- McFadgen, B.G.; Walton, A.J. 1996: Report of investigation for the New Zealand Historic Places Trust into garden soils at the Johnston Trust Estate. Unpublished report by the Department of Conservation for New Zealand Historic Places Trust.
- McGlone, M.S.; Jones, K.L. 2004: The impact of Polynesian settlement on the vegetation of the coastal Bay of Plenty. Pp. 20–44 in Irwin, G.J. (Ed.) 2004: Kohika. The archaeology of a late Maori lake village in the Ngati Awa rohe, Bay of Plenty, New Zealand. Auckland University Press, Auckland.
- McGlone, M.S.; Pullar W.A. 1976: More about the Kohika Site, Bay of Plenty. *Historical Review* 24: 110–113.
- McGovern-Wilson, R. 1995a: Archaeological investigations and monitoring for stage 4 of the development at Royal Palm Beach Estate, Papamoa. SouthernArc (unpublished).
- McGovern-Wilson, R. 1995b: Archaeological investigations at Tupatika Pa Site (W15/9), Whakatane, for New Zealand Historic Places Trust (Authority 1994/73). SouthernArc (unpublished).
- McIntosh, A. 2004: Tourist appreciation of Maori culture in New Zealand. *Tourism Management* 24(4): 1–15.
- McKercher, B.; du Cros, H. 2002: Cultural tourism. The partnership between tourism and cultural heritage management. The Haworth Hospitality Press, New York.
- McKercher, M. 2001: Attitudes to a non-viable community-owned heritage tourist attraction. *Journal of Sustainable Tourism* 9(1): 29–43.
- McKinnon, M. (Ed.) 1997: New Zealand historical atlas. David Bateman, Auckland.
- Meade, H. 1870: A ride through the disturbed districts of New Zealand. J. Murray, London.
- Melvin, L.W. 1957: Robley—soldier with a pencil. Tauranga Historical Society, Tauranga.
- Melvin, L.W. 1990: Horatio Gordon Robley soldier artist in the Bay of Plenty. Tauranga Historical Society, Tauranga.
- Ministry of Tourism 2005: The international backpacker market. Ministry of Tourism, Wellington.
- Ministry of Tourism 2007a: Domestic travel survey—commentary. Year end September 2007. Ministry of Tourism, Wellington.
- Ministry of Tourism 2007b: New Zealand tourism forecasts 2007–2013. Ministry of Tourism, Wellington. www.tourismresearch.govt.nz/ (viewed 28 February 2008).
- Ministry of Tourism 2008: Tourism leading indicators monitor series 2008/1. www.tourismresearch.govt.nz/ (viewed 28 February 2008).
- Mitcalfe, B. 1968: Puraku, gunfighters' pa. *New Zealand Archaeological Association Newsletter* 11(3): 126–127.
- Mitchell, J. 1984: The history and archaeology of the armed constabulary sites along the Napier-Taupo Road, 1869–1885. Unpublished M.A. research essay, University of Auckland, Auckland.
- Mitchell, S.R. 1939: Obsidian scrapers Bay of Plenty, New Zealand. *Journal of the Polynesian Society* 48(1): 56–59.

- Monin, P. 2001: This is my place, Hauraki contested 1769–1875. Bridget Williams Books, Wellington.
- Moore, K.W. 1963: The sunken Island in Lake Rotoma. *Historical Review* 11(4): 203–204.
- Moore, K.W. 1965: Maori double canoe off Whale Island 1769. *Historical Review* 13(2): 103–104.
- Moore, K.W. 1972: Salvage excavation at Port Ohope N69/87. *Historical Review* 20(1): 46–49.
- Moore, K.W. 1973: Archaeology at Whakatane, New Zealand, part 1. *Historical Review* 21: 113–122.
- Moore, K.W. 1974: Archaeology at Whakatane, New Zealand, part 2. *Historical Review* 22: 50–63.
- Moore, K.W. 1975: The Kohika site N68/104 Bay of Plenty: a preliminary report. *Historical Review* 23(1): 60–61.
- Moore, K.W. 1976: Kohika site, N68/104, Bay of Plenty. *Historical Review* 24(2): 114.
- Moore, K.W. 1991: Kawerau—its history and background. Kawerau District Council.
- Moore, P.R. 1971: Preliminary investigation of the Tahanga Basalt, Coromandel Peninsula. *New Zealand Archaeological Association Newsletter* 18(1): 32–36.
- Moore, P.R. 1977: A study of the Whakatane adze collection. *Historical Review* 25: 1–11.
- Moore, P.R. 1981: An early stone source at Maketu, Bay of Plenty. *Historical Review* 29: 19–23.
- Moore, P.R. 1987: Historic archaeological sites on Whale Island. *Historical Review* 35(1): 30–37.
- Moore, P.R. 1994: Whale Island sulphur. *Historical Review* 42(1): 32–35.
- Moore, P.R. 1997: Sinking of the treasure island reef, gold mining at Waihi Beach 1998–1910. *Historical Review* 24(2): 75–79.
- Moore, P.R. 2000: Peninsula Report 00/02 Report on exercise of Authority 1998/107, U13/1110. Unpublished report.
- Moore, P.R. 2001a: Archaeological report on railway bridge piers near commodore corner, Athenree Gorge, Western Bay of Plenty. Peninsula Research report 2001-01.
- Moore, P.R. 2001b: Prehistoric exploitation of andesite at Orokawa Bay, Western Bay of Plenty. *Archaeology in New Zealand* 44(2): 102–108.
- Moore, P.R. 2004: Sources of the Kohika obsidian artefacts. Pp. 168–176 in Irwin, G.J. (Ed.) 2004: Kohika. The archaeology of a late Maori lake village in the Ngati Awa rohe, Bay of Plenty, New Zealand. Auckland University Press, Auckland.
- Moore, P.R. 2005: Cultural distribution of the Waihi obsidian. *Archaeology in New Zealand* 48(1): 70–76.
- Moore, P.R.; Coster, J. 1989: Waihi obsidian. *Archaeology in New Zealand* 32(1): 26–30.
- Moore, P.R.; Ritchie, N. 1996: Coromandel gold, a guide to the historic goldfields of the Coromandel Peninsula. Dunmore Press, Palmerton North.
- Nairn, I.A.; Self, S.; Cole, J.W.; Leonard, G.S.; Scutter, C. 2001: Distribution, stratigraphy, and history of proximal deposits from the c. AD 1305 Kaharoa eruptive episode at Tarawera volcano, New Zealand. *New Zealand Journal of Geology and Geophysics* 44: 467–484.
- Neich, R. 2001: Carved histories. Auckland University Press, Auckland.
- Neich, R. 2002: The carved gateways of Maketu: the treasures of Ngati Pikiao carving style. *Historical Review* 50(1): 1–33.
- Nevin, D.; Nevin, G. 1978: Archaeological site survey Rotoehu S.F. 88. New Zealand Forest Service (unpublished).
- Nevin, D.; Nevin, G. 1979a: Archaeological site survey Kaimai Mamaku State Forest Park N.Z. Forest Service. New Zealand Forest Service (unpublished).
- Nevin, D.; Nevin, G. 1979b: Archaeological site survey Mangtu SF 108 Mata SF 124 Rotorua Conservancy. New Zealand Forest Service (unpublished).

- Nevin, D.; Nevin, G. 1979c: Archaeological site survey Patunamu SF 102 Rotorua Conservancy. New Zealand Forest Service (unpublished).
- Nevin, D.; Nevin, G. 1979d: Archaeological site survey Whirinaki SF58. New Zealand Forest Service (unpublished).
- Nevin, D.; Nevin, G. 1980a: Archaeological site survey Kaimai-Mamaku State Forest Park, Rotorua Conservancy. New Zealand Forest Service (unpublished).
- Nevin, D.; Nevin, G. 1980b: Archaeological site survey Whirinaki SF58. New Zealand Forest Service (unpublished).
- Nevin, D.; Nevin, G. 1980c: Archaeological sites of the engagement at Te Tapiri, 1865. *New Zealand Archaeological Association Newsletter* 23(1): 7-10.
- Newman, M. 1988: Archaeological investigations in the vicinity of Lake Rotoaira and the lower Tongariro River 1966-71. *New Zealand Historical Places Trust Publication* 21.
- Newnham, R.M.; Lowe, D.J.; Wigley, G.N.A. 1998: Late Holocene palynology and palaeovegetation of tephra-bearing mires at Papamoa and Waihi Beach, Western Bay of Plenty, North Island, New Zealand. *Journal of the Royal Society of New Zealand* 25(2): 283-300.
- Nicholls, J.L. 1991: History of the vegetation. Pp. 11-14 in Clarkson, B.D.; Smale, M.C.; Ecroyd, C.E. (Comps): Botany of Rotorua. Forest Research Institute, Rotorua.
- O'Keeffe, M.P. 1991: Prehistoric settlement in the Western Bay of Plenty. Unpublished M.Litt. thesis, University of Auckland, Auckland.
- Palmer, R.L. 1994: A comparative analysis between Kauri Point Pa and Swamp Site obsidian collections. Unpublished M.A. research essay, University of Auckland, Auckland.
- Papakura, M. 1938: The old-time Maori. Victor Gollancz, London.
- Parham, W.T. 2000: Digging up a flour mill. *Historical Review* 48(1): 5-7.
- Pepa, K. 1993: Mata 1 shell analysis. Unpublished report for 03.340 field methods in archaeology field school 1993, Department of Anthropology, University of Auckland.
- Petchey, F.J. 1993a: Betwixt and between, the lithics of Matakana Island: research into their origins. Unpublished MA research assignment, University of Auckland, Auckland.
- Petchey, F.J. 1993b: Preliminary excavation report, Ureturituri, Area 1. University of Auckland Field school Matakana Island, Bay of Plenty, 1993. Department of Anthropology, University of Auckland (unpublished).
- Peters, K. 1980: Excavation report on the archaeological investigation around the niu at Kuranui. Excavation permit 1980/12 (unpublished).
- Peters, K. 1990: Conservation of a niu pole at Kuranui. In: Timber and tin. Proceedings 1st ICOMOS conference on vernacular structures. ICOMOS.
- Phillips, C.A. 1999a: Assessment of damage to Tamapahore Pa, Papamoa, Tauranga. Unpublished report for New Zealand Historic Places Trust.
- Phillips, C.A. 1999b: Stabilisation and mitigation of Tamapahore Pa, Papamoa, Tauranga. Unpublished report for New Zealand Historic Places Trust.
- Phillips, C.A. 2000: Waihou journeys, the archaeology of 400 years of Maori settlement. Auckland University Press.
- Phillips, C.A.; Allen, H. 1996a: Anatere Pa, Athenree, Bay of Plenty. *Archaeology in New Zealand* 39(4): 264-277.
- Phillips, C.A.; Allen, H. 1996b: Excavation at Anatere Pa, U13/46(N53/79) Athenree, Bay of Plenty. Unpublished report to NZ Historic Places Trust.
- Phillips, C.A.; Johns, D.; Allen, H. 2002: Why did Maori bury artefacts in the wetlands of pre-contact Aotearoa/New Zealand. *Journal of Wetland Archaeology* 2: 39-60.
- Phillips, F.L. 1989: Nga tohu a Tainui, landmarks of Tainui. Vol 1. Tohu Publishers, Otorohanga.
- Phillips, F.L. 1995: Nga tohu a Tainui, landmarks of Tainui. Vol 2. Tohu Publishers, Otorohanga.

- Phillips, K.J. 1996: The archaeology of the eastern Bay of Plenty. Unpublished MA thesis, University of Auckland, Auckland.
- Phillips, K.J. 1999a: Archaeological investigation HPT Authority 1997/101 Renouf Property proposed subdivision Burke Road Ohiwa. Unpublished report for HPT.
- Phillips, K.J. 1999b: Archaeological investigation HPT Authority 1998/114 Winch property U14/166 house site formation. Reid Road, Papamoa. Unpublished report.
- Phillips, K.J. 1999c: Preliminary report: investigation of archaeological sites carried out under conditions of HPT Authority 1998/46 and 1999/01. Unpublished report for Opus International Consultants Ltd.
- Phillips, K.J. 2000a: Archaeological survey and assessment of effects, Waihi Beach sewerage reticulation scheme. Unpublished report prepared for Opus International Consultants.
- Phillips, K.J. 2000b: Archaeological survey and heritage assessment. Rohe of Ngati Hangarau, North Bethlehem. Unpublished report.
- Phillips, W.J. 1947: The Rua Hoata shelter, Waikato River. *Journal of the Polynesian Society* 56: 336-339.
- Porteous, D. 1997: Themes in heritage tourism. Pp. 258-259 in Stokes, E.; Begg, M. (Eds): *Te Hononga Ki Te Whenua, belonging to the land: people and places in the Waikato Region*. New Zealand Geographical Society, Hamilton.
- Prickett, N. 2002: The archaeology of New Zealand shore whaling. Department of Conservation, Wellington.
- Pullar, W.A. 1961a: Kapu Te Rangi (Toi's Pa) (b) soil and volcanic ash investigation. *Historical Review* 9(3): 120-128.
- Pullar, W.A. 1961b: The possibilities of early Polynesian occupation at Thornton. *Historical Review* 9: 129-130.
- Pullar, W.A. 1962: Soils and agriculture of the Gisborne Plains. *Soil Bureau Bulletin* 20. DSIR, Wellington.
- Pullar, W.A. 1963: River courses and shorelines at Whakatane. *Historical Review* 11(4): 199-202.
- Pullar, W.A. 1975: Fish weir discovery, Rotorua. *Historical Review* 23(2): 98.
- Pullar, W.A. 1985: Soils and land use of Rangitaiki Plains, North Island, New Zealand. *New Zealand Soil Survey Report* 86.
- Pullar, W.A.; Hewitt, S.R.; Heine, J.C. 1978: Soils and land use of Whakatane Borough and environs, Bay of Plenty, New Zealand. *Soil Bureau Bulletin* 38. DSIR, Wellington.
- Pullar, W.A.; Kohn, B.P.; Cox, J.E. 1977: Fallout Kaharoa ash and Taupo pumice, and sea rafted Loisel pumice, Taupo pumice, and Leigh pumice in northern and eastern parts of the North Island, New Zealand. *New Zealand Journal of Geology and Geophysics* 20: 697-717.
- Pullar, W.A.; Moore, K.W.; Scott, A.S. 1967: Field archaeology in the Bay of Plenty. *Historical Review* 15(1): 105-114.
- Pullar, W.A.; Pain, C.F.; Johns, J.P. 1967: Chronology of terraces, flood plains, fans and dunes in the lower Whakatane Valley. Pp. 175-180 in: Proceedings 5th New Zealand Geography Conference, Auckland 1967.
- Rawle, H. 1981: The green hill and the gold. Privately published, Waihi.
- Reed, A.H. 1958: Legends of Rotorua and the hot lakes. Reed, Wellington.
- Richmond, B.M.; Nelson, C.S.; Healy, T.R. 1984: Sedimentology and evolution of Ohiwa Harbour, a barrier-impounded estuarine lagoon in Bay of Plenty. *New Zealand Journal of Marine and Freshwater Research* 18: 461-478.
- Rijkse, W.C.; Cotching, W.E. 1995: Soils and land use of part Tauranga County, North Island, New Zealand. Landcare Research Technical Record. Manaaki Whenua - Landcare Research, Hamilton.

Ritchie, N.A. 1991: Changing landscapes and human settlement: the Tarawera eruption area before and after the eruption, June 1886. *Archaeology in New Zealand* 34(1): 33–46.

Robinson, C.H. 1961: The discovery of gold in the Kaharoa District. *Rotorua Legend* 1(2): 52–53.

Robley, H.G. 1896: Moko or Maori tattooing. Chapman and Hall, London.

Rout, E. 1926: Maori symbolism: being an account of the origin, migration, and culture of the New Zealand Maori as recorded in certain sacred legends. Harcourt, Brace & Co., New York, London.

Rowe, S.; McKay, B. 1997: The Horahora power station. Privately printed, Matamata.

Ryan, C. 2002: Equity, management, power sharing and sustainability—issues of the ‘new tourism’. *Tourism Management* 23(1): 17–26.

Ryan, C.; Cave, J. 2005: Structuring destination image: a qualitative approach. *Journal of Travel Research* 44: 143–150.

Ryan, C.; Huyton, J. 2000: Who is interested in Aboriginal tourism in the Northern Territory, Australia? A cluster analysis. *Journal of Sustainable Tourism* 8(1): 53–88.

Ryan, C.; Huyton, J. 2002: Tourists and aboriginal people. *Annals of Tourism Research* 29(3): 631–647.

Schmidt, M. 1996: The commencement of pa construction in New Zealand prehistory. *Journal of the Polynesian Society* 105(4): 441–460.

Schofield, J.C. 1962: A preliminary report on the age of rock carvings and ‘cave dwellings’, Ongari Point, Katikati. *Archaeological Association Newsletter* 5(1): 67–69.

Schofield, J.C. 1964: A coastal section below the pa site at Ongare Point. *New Zealand Archaeological Association Newsletter* 7(2): 98–99.

Schofield, J.C. 1968: Dating of recent low sea level and Maori rock carvings Ongari Point. *Earth Science Journal* 2(2): 167–174.

Seccombe, T.T. 1959: Tarawera sulphur mine. *Historical Review* 7(1): 20.

Seelenfreund-Hirsch, A.C. 1985: The exploitation of Mayor Island obsidian in prehistoric New Zealand. Unpublished PhD thesis, University of Otago, Dunedin.

Semadeni, C.A. 1912: Concerning certain ancient Maori stone implements found at Tauranga. *Transactions of the New Zealand Institute* 45: 385–386.

Shawcross, F.W. 1964: Archaeological investigations at Ongari Point, Katikati, Bay of Plenty. *New Zealand Archaeological Association Newsletter* 7(2): 79–98.

Shawcross, F.W. 1965: Report on archaeological investigations at Thornton, Whakatane, Bay of Plenty. *Historical Review* 13(3&4): 186–192.

Shawcross, F.W. 1966: Ongari Point—second season. *New Zealand Archaeological Association Newsletter* 9(2): 53–71.

Shawcross, F.W. 1977: Kauri Point swamp: the ethnographic interpretation of a prehistoric site. Pp. 277–305 in Sieveking, G. de G. (Ed.): Problems in economic and social archaeology. Duckworth.

Shepherd, M.J.; McFadgen, B.G.; Betts, H.D.; Sutton, D.G. 1997: Formation, landforms, and palaeoenvironment of Matakana Island. *Science & Research Series* 102. Department of Conservation, Wellington.

Shortland, E. 1856: Traditions and superstitions of the New Zealanders. Longman, Brown, Green, Longmans and Roberts, London.

Shortland, E. 1882: Maori religion and mythology. Longman Green, London.

Simmons, A. 1991: Te Wairoa, the buried village: a summary of recent research and excavations. *Australian Journal of Historical Archaeology* 9: 56–62.

Simmons, D.R. 1971a: Anthropomorphic and zoomorphic Maori bowls from Hauraki and the Bay of Plenty. *Records of the Auckland Institute and Museum* 10: 59–64.

- Simmons, D.R. 1971b: 'Godstick' head from Katikati. *Records of the Auckland Institute and Museum* 10: 65-67.
- Simmons, D.R. 1986: Iconography of New Zealand Maori religion. Institute of Religious Iconography, State University Groningen. E.J. Brill, Leiden.
- Sissons, J. 1991: Te waimana, the spring of mana. Tuhoe history and the colonial encounter. University of Otago Press, Dunedin.
- Smith, S.P. 1953: An 1858 journey to the interior. Taranaki Herald, New Plymouth.
- Spiers, J.J.K. 1971: The Murapara rock carvings, Kaingaroa forest. *Historical Review* 19(2): 147.
- Spring-Rice, W. 1982: A dated collection of matchboxes from Fort Galatea historic reserve, Bay of Plenty. *New Zealand Archaeological Association Newsletter* 25(2): 103-112.
- Spring-Rice, W. 1983a: Excavation at Waimango Springs Agricultural Flat. Unpublished report.
- Spring-Rice, W. 1983b: The history and archaeology of Fort Galatea, Bay of Plenty, New Zealand, 1869-1969. Unpublished MA thesis, University of Auckland, Auckland.
- Spring-Rice, W. 1987: Interim report on excavations at Fort Clarke (N77/666), Matahina Forest, Bay of Plenty.
- Stack, J.W. 1935: Early maoriland adventures. Edited A.H. Reed, A.H. Reed, Dunedin.
- Stafford, D.M. 1961: Pre-settlement Maori and Pakeha relationships. *Rotorua Legend* 1(2): 22-27.
- Stafford, D.M. 1962: Don Stafford replies. *Rotorua Legend* 2(1): 4-20.
- Stafford, D.M. 1967: Te Arawa. Reed, Wellington.
- Stafford, D.M. 1983: Flying the thermal skies, a history of aviation in the Rotorua district. Thermalart Productions, Rotorua.
- Stafford, D.M. 1986: The founding years in Rotorua. Ray Richards and Rotorua District Council.
- Stafford, D.M. 1988: The new century in Rotorua. Ray Richards and Rotorua District Council.
- Stafford, D.M. 1994: Landmarks of Te Arawa, Volume 1: Rotorua. Reed, Auckland.
- Stafford, D.M. 1996: Landmarks of Te Arawa, Volume 2: Rotoiti, Rotoehu, Rotoma. Reed, Auckland.
- Stafford, D.M. 1999: Pakiwaitara, Te Arawa Stories of Rotorua. Reed, Auckland.
- Stafford, D.M. 2007: A wild wind from the north. Hongi Hika's 1923 invasion of Rotorua. Reed, Auckland.
- Statistics New Zealand 2007a: Quarterly review, September 2007. Statistics New Zealand, Wellington.
- Statistics New Zealand 2007b: Tourism satellite account 2003-2006. Statistics New Zealand, Wellington.
- Steedman, J.A.W. n.d.: He toto, te ahu matu a nga tupuna. Privately published.
- Stewart, A.B. 1908: My simple life in New Zealand. Robert Banks and Son, London.
- Stokes, E. 1980: A history of Tauranga County. Dunmore Press, Palmerston North.
- Stokes, E. 1997: Pai Marire and raupatu at Tauranga 1864-1867. *New Zealand Journal of History* 31: 58-84.
- Stokes, E. 2002: Wiremu Tamihana, Rangatira. Huia Press, Wellington.
- Stott, R. 1978: Kaimai, the story of the Kaimai tunnel and the east coast main trunk railway. Southern Press, Wellington.
- Tapsell, E. 1940: Historic Maketu. Rotorua Morning Post, Rotorua.
- Tapsell, E. 1972: A history of Rotorua. Privately published, Rotorua.
- Tapsell, P. 2000: Pukaki, a comet returns. Reed, Auckland.
- Tapsell, P. 2002: Papamoa pa. Pp. 272-286 in Kawharu, M. (Ed.): Whenua, managing our resources. Reed, Auckland.

- Tapsell, P. 2006: Ko taura, Maori treasures of New Zealand. David Bateman, Auckland.
- Taylor, S.G. 1969: The story of Te Puke. Privately published.
- Twohill, N. 1988: The Piako County tramway. *New Zealand Archaeological Association Newsletter* 31(2): 122-129.
- Urlich-Cloher, D. 2003: Hongi Hika, warrior chief. Viking, Auckland.
- Vaile, E.E. 1939: Pioneering the pumice. Whitcombe and Tombs, Christchurch.
- van der Wouden, A. 1994: Whale Island, Motuohora. *Whakatane & District Historical Society Monograph No. 25*.
- van der Wouden, A. 2001: Flax industry in the Whakatane district. *Historical Review* 49(2): 76-87.
- van der Wouden, A.; Moore, P.R. 1994: The rock quarries on Whale Island. *Historical Review* 42(1): 36-39.
- Vennell, C.W. 1984: Brown and The Elms. The Elms Trust, Tauranga.
- Vennell, C.W.; Gordon, M.; FitzGerald, M.E.W.; McMillan, T.E.; Griffiths, G.G. 1951: Centennial history of the Matamata Plains. Matamata County Council.
- Walker, R. 2007: Opotiki-Mai-Tawhiti, capital of Whakatohea. Penguin Books, North Shore.
- Wallace, R.T. 1999: Charcoal from Matakana Island and Papamoa Dunes, Bay of Plenty, North Island, New Zealand. Unpublished research paper.
- Wallace, R.T.; Irwin, G. 1999: A Kohika wharepuni: house, construction methods of the late pre-contact Maori. *New Zealand Journal of Archaeology* 21: 67-86.
- Wallace, R.T.; Irwin, G.J. 2004: The wooden artefacts from Kohika. Pp. 83-121 in Irwin, G.J. (Ed.): Kohika. The archaeology of a late Maori lake village in the Ngati Awa rohe, Bay of Plenty, New Zealand. Auckland University Press, Auckland.
- Wallace, R.T.; Irwin, G.J.; Neich, R. 2004: Houses, pataka and woodcarving at Kohika. Pp. 122-148 in Irwin, G.J. (Ed.): Kohika. The archaeology of a late Maori lake village in the Ngati Awa rohe, Bay of Plenty, New Zealand. Auckland University Press, Auckland.
- Walls, G.; Scheele, S.; Paul, B. 1990: National flax collection. Pp. 186-192 in Harris, W.; Kapoor, P. (Eds): Nga mahi Maori o te wao nui a tane, contributions to an international workshop on ethnobotany, Botany Division DSIR, Christchurch.
- Walters, M. 1979: An investigation of archaeology in New Zealand as a means of establishing views about the past. Unpublished MA thesis, University of Otago, Dunedin.
- Walters, R.A.; Goff, J. 2003: Assessing tsunami hazard along the New Zealand coast. *Science of Tsunami Hazards* 21(3): 137-153.
- Walton, A. 1981: A storepit site (N44/574) at Kawerau. *Historical Review* 29(2): 71-81.
- Walton, A. 1985: Megatrowels and motorscrapers: aims and methods in fast rescue excavation. *New Zealand Archaeological Association Newsletter* 28(4): 235-242.
- Walton, A. 1998: Three Tauranga Pa, Maungatapu, Otumoetai and Motuhoa. *Fort and Works* 5: 6-7.
- Walton, A. 2006: How big are pa? *Archaeology in New Zealand* 49(3): 174-187.
- Walton, A.; McFadgen, B.G. 1990: An archaeological survey of Motiti Island, Bay of Plenty. Department of Conservation.
- Warbrick, A. 1934: Adventures in geyserland. A.H. Reed, A.H. Reed, Dunedin.
- Wasko, J.; Phillips, M.; Meehan, E.R. 2001: Dazzled by Disney? The global Disney audiences project. Leicester University Press.
- Wellman, H.W. 1962: Holocene of the North Island of New Zealand: a coastal reconnaissance. *Transactions of the Royal Society of New Zealand, Geology* 1(5): 29-99.
- Williams, L. 1980: Kohika coprolites. Unpublished MA research essay, University of Auckland, Auckland.

- Wilson, C.J.N.; Ambroseys, N.N.; Bradley, J.; Walker, G.P.L. 1980: A new date for the Taupo eruption, New Zealand. *Nature* 288: 252-253.
- Wilson, J.A. 1906: The story of Te Waharoa, together with sketches of ancient Maori life and history. Whitcombe and Tombs, Christchurch.
- Wilson, M.G. 1962: In search of the great fleet. *Whakatane and District Historical Society Memoir No. 2*.
- Worthy, T.H. 2001: The youngest giant: discovery and significance of the remains of a giant moa (*Dinornis giganteus*) near Turangi in the central North Island. *Journal of the Royal Society of New Zealand* 32(1): 183-187.
- Worthy, T.H.; Holdaway, R.N. 2002: The lost world of the moa. Prehistoric life of New Zealand. Indiana University Press, Bloomington and Indianapolis.
- Wright, I.; Gamble, J.; Shane, P. 2003: Submarine silicic volcanism of the Healy caldera, southern Kermadec arc (SW Pacific): I—volcanology and eruption mechanisms. *Bulletin of Volcanology* 65(1): 15-29.
- Wright, I.; Garlick, R.; Mitchell, J. 2002: Seabed survey finds new volcanoes. *New Zealand Geographic* 60: 8-11.
- Yonge, J.R. 1985: New Zealand railway atlas. Quall Map Co, Exeter.

15. Glossary

Admixture soils Soils with added sand/gravel. Sometimes called plaggen soils or made soils.

Archaic The period of the earliest cultural manifestation of Polynesians in New Zealand. The earliest part of the prehistoric period in New Zealand.

Battery A place where ore was processed by hammer crushing and further grinding to enable precious metal to be extracted.

Contact period The period after the first European contact up until the time of colonial settlement. Generally a period from which there are some historic records and when there was some cultural change in Maori society resulting from the contact.

Find spot A place where an artefact has been found.

Hangi Maori earth oven.

Kauri dams Dams built in areas of kauri logging that were tripped to create a flood to drive logs downstream for processing or transport.

Kingite Maori supporters of the Maori King and the King movement.

Kokowai Red ochre used by Maori for decoration.

Kupapa Maori forces sympathetic to the Government.

Manaia A stylised figure used in Maori carving.

Midden Remains of discarded material dominated by food waste. For Maori sites, typically shellfish with rarer bone material; may include artefacts. For European sites, the range can be much wider.

Pa Maori fortification—usually an occupied site. Archaeologically, a site with earthwork and/or palisade defences.

Pataka Maori storehouse raised on posts.

Pit Excavated feature in Maori sites believed to have been used primarily for kumara storage; depression in the ground in a site that is believed to be evidence of such a pit.

Platform A levelled area with the ground sloping away on all sides—a term applied in field descriptions of archaeological sites. Maori and European sites.

Prehistoric Time before the existence of written records. The term does not exclude traditional history from being relevant to the events of this time.

Queenite Maori sympathetic to Queen Victoria's Government—as opposed to Kingites, who were not.

Rua An artificial cave dug from a vertical face, or a bell-shaped pit dug from the ground surface, both believed to have been used primarily for kumara storage. Archaeologically, a round depression in the ground that is believed to be the surface indication of such a bell-shaped pit, infilled or collapsed.

Snigging track A track along which trimmed logs were hauled out of the bush by horses, oxen or steam haulers.

Tailings site A disposal place of the waste products of mining.

Tapu A Maori concept—set apart, forbidden, sacred.

Taua Maori war party.

Terrace A levelled area. Maori and European sites.

Tramway Wood or iron light rail for man-powered, gravity, rope-hauled or locomotive-hauled trucks hauling flax, timber, ore, etc.

Appendix 1

SITE SURVEYS

A working paper ‘Bay of Plenty archaeological resource statement, first report—site survey review’ (Law 2002a) was produced as part of the preparation for this report. This working paper reviews the site records in the New Zealand Archaeological Association site recording scheme, and the published and much of the unpublished literature on the archaeology of the Bay of Plenty Conservancy of the Department of Conservation, to obtain information on the extent and quality of archaeological site recording.

The recording of historical archaeological sites has been weak in all parts of the Bay of Plenty area. Greater efforts are needed to record the archaeological features associated with the forestry, mining and transport sectors (many of which can still be readily seen on the ground), particularly in historical archaeology. Maori archaeological sites are better known, but the coverage is very uneven and variable in quality. The number of sites per map sheet varies from thousands down to none. More survey effort is particularly needed in the middle Rangitaiki valley, the Rotorua area, and south and southeast of Rotorua.

Islands in the Bay of Plenty area have generally been adequately surveyed, and although some areas still need to be completed, few surprises are likely to arise from this work. The general form of the occupation of these islands is now very clear.

The New Zealand Archaeological Association upgrade project should deal with some of the quality issues that presently exist in the record.

TABLE A1.1. SITE RECORDS BY NZMS 260 1:50 000 MAP SHEET (BAY OF PLENTY AREA ONLY; SHEETS T-W 12-19).

Blank squares are outside the area reviewed.

	T	U	V	W
12		20		
13	516	895		
14	187	2908	181	
15	31	635	1264	723
16	54	139	287	255
17		4	77	
18		0	92	
19			5	

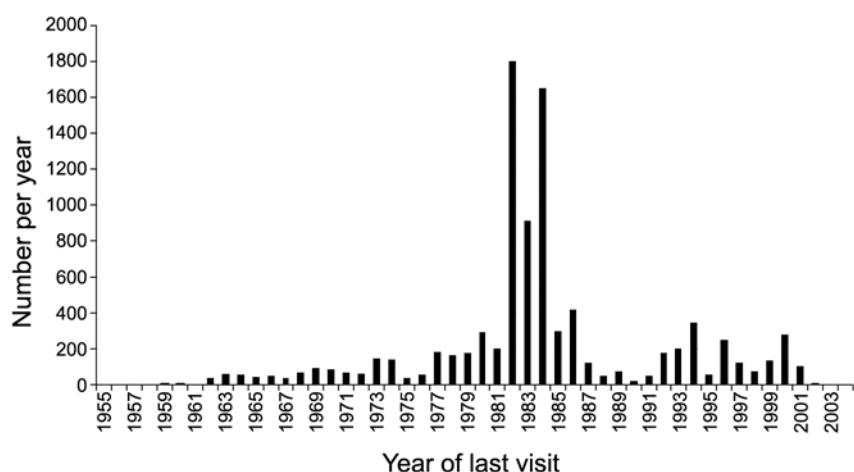
Table A1.1 gives the numbers of sites recorded as at March 2002 by NZMS 260 1:50 000 map sheet.

It was not possible to provide a detailed representation of the areas surveyed, as few of the more formal surveys had recorded adequate information on the total land area covered by the survey.

Figure A1.1 shows the year of the last recorded visit to a site in the Bay of Plenty area, as entered in the New Zealand Archaeological Association site recording scheme at the beginning of 2002. From

this, it is clear that the recording of sites in the Bay of Plenty area was dominated by a period of intense activity in the early 1980s, when the New Zealand Historic Places Trust funded surveys in the Tauranga, Te Puke and Whakatane areas. Some of the recording effort, including the initial records on the files, arose from purely research interest. However, the upsurge

Figure A1.1. Dates of the year of last visit of the sites in the New Zealand Archaeological Association Site Recording Scheme—equivalent in most cases to the date of recording.



in records that followed was motivated by Bruce McFadgen's observation that horticultural development in the western Bay of Plenty was starting to overwhelm a landscape that had many unrecorded sites (McFadgen 1981). A similar threat was recognised in areas of hill country that were undergoing private afforestation, not controlled by the New Zealand Forest Service. These threats led to a programme that involved Historic Places Trust archaeologists and many temporary workers in a survey of Tauranga County. Motiti Island, the Whakatane and Waimana River valleys, and the Ohiwa hinterland were also surveyed, but this work was motivated (in part) by research interest, as the threats here were less (Jones 1984a, 1986; Walton & McFadgen 1990). The bulk of the file records arrived during this period.

Broadly in parallel with the Historic Places Trust initiatives, the New Zealand Forest Service became aware of the number of archaeological sites in state forests and used their own and contracted archaeologists to survey areas that were about to be prepared for planting or harvested in the case of existing forests (e.g. Nevin & Nevin 1978; 1979a-d; 1980a, b). In the early 1980s, the Maruka project contributed a concentrated cluster of sites in the Kawerau area (see Lawlor 1981, 1983b; Furey 1983)). Since that time, major archaeological survey projects that have blended protection or recovery aims with research have been carried out at Matakana (Marshall et al. 1993a, b; 1994a, b) and Papamoa (Fredricksen et al. 1996). Both projects contributed a large number of new sites to the records. In addition, parts of the public estate have been reviewed for their archaeological content, and reports have been produced that give overviews of these and a more detailed area by area outline (e.g. Anon 1999; Grouden 1993a, b).

In the 1990s, there have been a lot of relatively small-scale archaeological survey projects carried out by consulting archaeologists dealing with development threats from urban development, energy projects, roading improvements and forestry. A steady flow of updated and new records has resulted from this work.

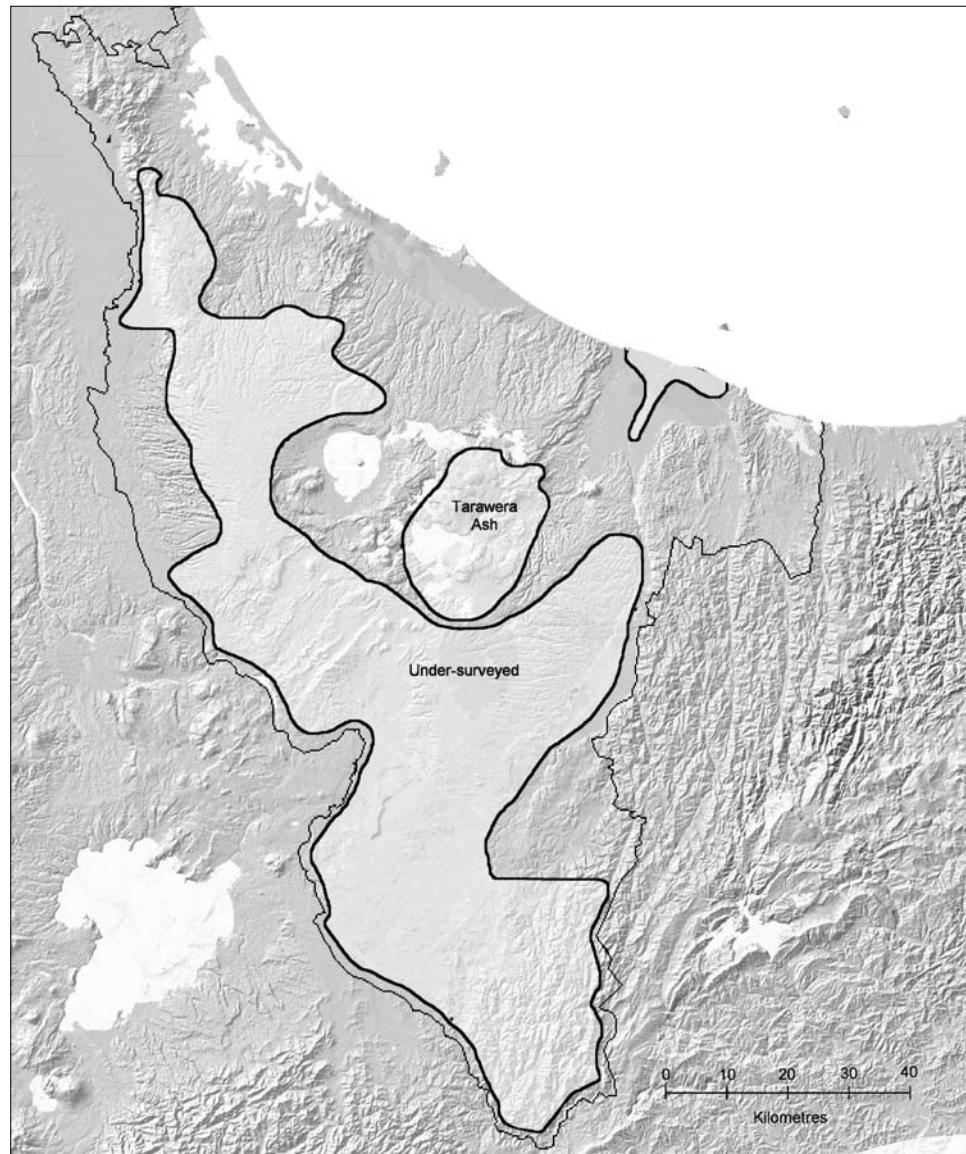
The project bibliography includes many reports generated from survey work. The working paper contains a map sheet by map sheet review of surveys. In general, the offshore island areas are well covered compared with some of the land areas.

The priority areas for new surveys should be the southern part of the Bay of Plenty area, excluding only Whirinaki. Historical archaeological evidence is poorly represented and is generally a priority, irrespective of location. The Mamaku area should have much from the native timber logging period, though little of this will yet be over 100 years old. Areas with deeper covers of Tarawera ash will not yield sites to conventional surveys. The offshore islands have received a disproportionate amount of attention and thus have low priority compared with other areas. Coverage of Matakana Island is very patchy, with high numbers of sites being recorded in forestry blocks that have been surveyed. Adjacent unsurveyed blocks have very few records but are likely to have just as many sites as the surveyed blocks. The Rangitaiki Plain must have more sites than have been recorded, particularly along the coastal strip where localised investigations have demonstrated that sites are common.

Figure A1.2 shows the areas of the Bay of Plenty area that are under-surveyed. These areas are not small. At a total area of approximately 4670 km², they constitute an area greater than the Chatham Islands and Stewart Island combined.

Figure A1.2. Distribution of all recorded sites in the Bay of Plenty region.

The Tarawera ash patch inhibits site discovery, and the low frequency of sites along the Rangitaiki Plain coast appears to reflect low survey intensity. Inland areas lack many recorded sites. Although it is likely that this area was used less by Maori, more sites (both Maori and non-Maori) should be discovered with more surveying.



Appendix 2

RECORDED ARCHAEOLOGICAL EXCAVATIONS

In addition to the working paper mentioned in Appendix 1, a second working paper ‘Bay of Plenty archaeological resource statement, second report—excavated sites’ (Law 2002b) was produced for this review. The information in Table A2.1 has been drawn from this report. Sites where the New Zealand Historic Places Trust had issued authorities under its legislation for research excavations, or placed a condition on an authority for the destruction of a site stating that an investigation was required, but no report had been received at the time of the review for this study (mid-2002) have been excluded from this table. Details of those can be found in Law (2002b), as can authority numbers in many cases. The old-style NZMS1 map numbers are given where relevant, as the older excavated sites have information recorded only under those numbers.

There is a total of 131 sites listed in Table A2.1. They vary enormously in extent from major multi-season research efforts on a single site that resulted in many hours of processing of samples collected, to mitigation excavations carried out prior to or during destructive earthworks with as little as 1 day’s fieldwork by one person and no subsequent analysis. The distribution of the excavated sites is predominantly coastal, as is the distribution of recorded sites. The Rotorua area has fewer excavated sites than would be expected based on known sites. The excavated sites are shown in Fig. A2.1.

TABLE A2.1. EXCAVATED SITES TO 2002.

MAP	NZAA NUMBER		NAME/LOCATION (AUTHORITY NO.)	TYPE	EXCAVATION	REFERENCES
	METRIC	IMPERIAL				
T14/	56	N57/73	West Kaimai	Pits		Coster & Johnston 1980
T14/	58	N57/75	West Kaimai	Pits		Coster & Johnston 1980
T15/	193		Kuranui			Peters 1980, 1990
U13/	4	N53-54/5	Kauri Point	Pa	1960, 1961, 1962, 1963, 1967	Ambrose n.d., 1962; Golson 1961c
U13/	4	N53-54/5	Kauri Point Swamp	Depository		Shawcross 1977
U13/	8	N53-54/10	Ongare	Pa	1963, 1964, 1965	Shawcross 1964, 1966
U13/	10		Ongare Rock Carvings			Schofield 1962
U13/	45	N53-54/6	Kauri Point undefended site	Pits	1963	Green 1963b, 1964
U13/	46	N53/79	Anatere	Pa	1980, 1995, 1996	Phillips & Allen 1996a,b
U13/	47	N53/80	Athenree	Pa	1980s	Unpublished excavation of a pa by McFadgen and Walton (DOC).
U13/	50	N53/83	Roretana Block, Athenree	Pa, middens, garden soil	1978	O’Keeffe 1991
U13/	974		Te Kauri Village	Midden		Grouden 1991
U13/	977		Te Kauri Village	Midden		Grouden 1991
U13/	978		Te Kauri Village	Pits		Grouden 1991
U13/	1110		169 Athenree Road, Athenree	Midden; Maori occupation area		Moore 2000

Continued on next page

Table A2.1—continued

MAP	NZAA NUMBER		NAME/LOCATION (AUTHORITY NO.)	TYPE	EXCAVATION	REFERENCES
	METRIC	IMPERIAL				
U14/	-		115 Fourth Ave, Tauranga	Midden		Bowers & Phillips 1997e
U14/	18		Kaimai	Rua		Coster 1977
U14/	38	N67/72	Ruahihi	Pa	1978	McFadgen & Sheppard 1984
U14/	44	N53/77	Koutunui	Pa	1980	McFadgen 1982; O'Keeffe 1991
U14/	166		Reid Road, Papamoa	Pa		K.J. Phillips 1999b
U14/	187		Ureturituri Pa, Matakana Island	Pa	1993	Petchey 1993b
U14/	209		Tamapahore Pa, Papamoa	Pa	1999	C.A. Phillips 1999a, b
U14/	243		Papamoa	Pa	1985	Anon. 1985; O'Keeffe 1991
U14/	519		26/28 Sixth Avenue, Tauranga	Historic: midden; house		Bowers & Phillips 1997b
U14/	526		Pacific Cove, Domain Road, Papamoa	Midden		Hooker 1998c
U14/	534		Papamoa, Trench B	Soil		Gumbley 1997
U14/	539		Grant Place storm water pipeline, Papamoa	Midden		Kahotea 1993
U14/	677		Wairoa Valley, western Bay of Plenty	Occupation area; midden		Bowers 1996
U14/	1675		Papamoa, Reid Rd.	Pit and terrace		Bowers & Phillips 1998
U14/	1710		Te Hana, Mt View subdivision, Papamoa (1998-71)	Midden		Hooker 1999a
U14/	1711		Parewaitai Estates Ltd, Papamoa	Midden		Hooker 1998d, 1999b
U14/	1712		Parewaitai Estates Ltd, Papamoa	Midden		Hooker 1998d, e
U14/	1713		Parewaitai Estates Ltd, Papamoa	Midden		Hooker 1998d, 1999b
U14/	1717		Papamoa, Royal Palm Beach	Midden		McGovern-Wilson 1995a
U14/	1720		Papamoa, Royal Palm Beach	Midden		McGovern-Wilson 1995a
U14/	1721		Summerlands Estate, Papamoa	Midden		Hooker 1998b
U14/	1722		Papamoa, Trench D	Soil		Gumbley 1997
U14/	2027		Waterview Estates, Waikite Rd, Welcome Bay, Tauranga	Terrace		
U14/	2031		Welcome Bay Subdivision, Tauranga			Hooker 1999c
U14/	2032		Welcome Bay Subdivision, Tauranga	Terrace; midden		Hooker 2000a
U14/	2035		Welcome Bay Subdivision, Tauranga			Hooker 1999c, 2000a
U14/	2037		Welcome Bay Subdivision, Tauranga	Pits		Hooker 1999c, 2000a
U14/	2240		Judea, Tauranga	Pa	1985, 1992	McFadgen 1985b; Kahotea 1992
U14/	2246		1132 Ohauiti Rd, Welcome Bay, Tauranga	Terrace		Hooker 1998f
U14/	2482		Tauranga	Settlement		Walton 1985
U14/	2788		Angus developments, Papamoa	Midden		Kahotea 1993
U14/	2789, 2790, 2791, 2792, 2793		Angus developments, Papamoa	Midden		Hooker 1995
U14/	2796, 2813, 2814		Papamoa, Royal Palm Beach			McGovern-Wilson 1995a
U14/	2833		Summerlands Estate, Papamoa	Midden		Hooker 1998b

Continued on next page

Table A2.1—continued

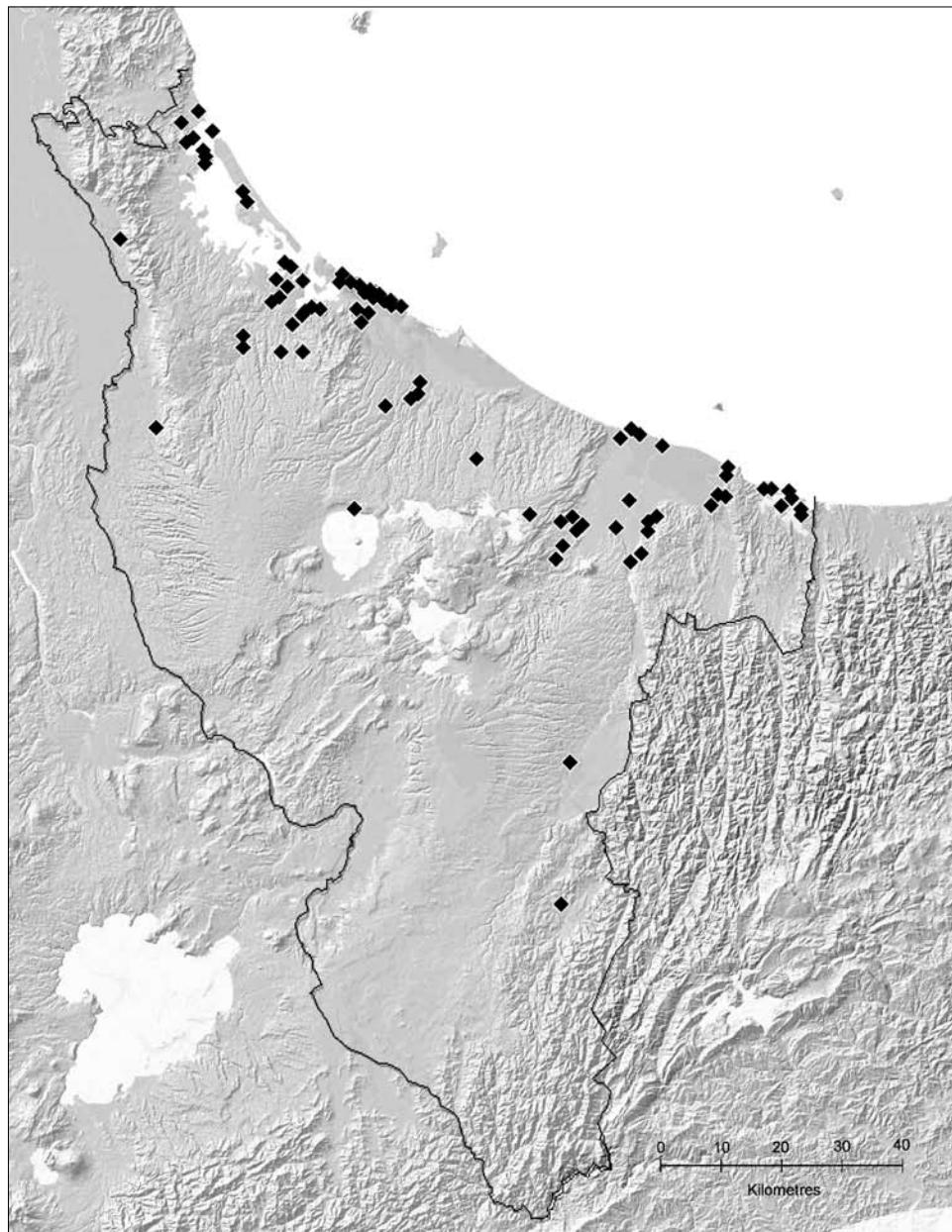
MAP	NZAA NUMBER		NAME/LOCATION (AUTHORITY NO.)	TYPE	EXCAVATION	REFERENCES
	METRIC	IMPERIAL				
U14/	2841		Papamoa, Johnson Trust	Midden		Fredricksen et al. 1995
U14/	2844		Papamoa Longview		1995	McFadgen & Walton 1996
U14/	2846		Papamoa	Midden		Hooker 1998a
U14/	2847		Papamoa	Midden		Hooker 1998a
U14/	2860		Papamoa, trench C	Soil		Gumbley 1997
U14/	2884, 2885, 2886		Papamoa	Midden	1997–78	
U14/	2887		Summerlands Estate, Papamoa	Midden		Hooker 1998b
U14/	2893		Parewaitai Estates Ltd, Papamoa	Midden		Hooker 1998d, 1999b
U14/	2894		Parewaitai Estates Ltd, Papamoa	Midden		Hooker 1999b
U14/	2895, 2896		Te Hana, Mt View subdivision, Papamoa (1998–71)	Midden		Hooker 1999a
U14/	2897, 2898		Papamoa (9900-066)	Midden		Hooker 2001
U14/	3060		North Bethlehem, Tauranga	Midden		Phillips 2000b
U14/	528, 529, 530, 531, 532, 1043, 1069		Kopurererua Valley, Tauranga	European settlement area		K.J. Phillips 1999c
U14/	2719, 2720, 2729, 2730		State Highway 2 project from Waihi Road to Cameron Road			K.J. Phillips 1999c
U15/	35		Tupakaria site, Rotorua.	Pa		Kahotea 1988
U15/	145		Pakotore (Matapara)	Pa	1959	Golson 1959, 1960; Golson & Stafford 1959
U15/	642		Maungarangi Rd, Paengaroa	Pit		Hooker 2000b
U16/			Te Wairoa		1990	Simmons 1991
V15/	80	N68/104	Kohika	Pa	1975	Irwin 1975, 2004; Moore 1975, 1976; McGlone & Pullar 1976; Boileau 1978; Lawlor 1975
V15/	560	N77/666	Fort Clarke, Matahina Forest	Redoubt		Spring-Rice 1987
V15/	495, 498, 491–494		Omataroa	Pa; pit; terrace		Bowers & Phillips 1997c, d
V15/	1209		Robbie's Midden, Tarawera River	Midden		C14 Database
V15/	418, 488, 489, 496, 497		Omataroa Forest	Midden, ovens		Bowers & Phillips 1997c, d
V16/			Waimango Springs, Agricultural Flat			Spring-Rice 1983a
V16/	32, 76		Omataroa Forest	Pa, terrace; midden		Bowers & Phillips 1997d
V16/	199	N77/574	Kawerau store pit site	Pit	1980	Walton 1981
V16/	211, 219, 220		Maruka	Undefended		Furey 1983; Lawlor 1983b
V16/	238	N77/606	Long Valley, Kawerau	Undefended		Furey 1981
V16/	243		Maruka	Undefended		Furey 1983; Lawlor 1983b
V17/	7	N86/5	Karamuramu	Redoubt	1980–81	Spring-Rice 1983b
V17/	8	N86/7	Fort Galatea	Redoubt	1971	Spring-Rice 1983b
V18/	16	N95/32	Whirinaki	Pit		Jones 1984b
V19/	34	N104/8	Runanga	Stockade, historic	1983	Mitchell 1984
W15/			Ohope, Te Horo Drive			Bowers & Phillips 1997a
W15/			Irirangi	Pa	1966	Pullar, Moore et al. 1967

Continued on next page

Table A2.1—continued

MAP	NZAA NUMBER		NAME/LOCATION (AUTHORITY NO.)	TYPE	EXCAVATION	REFERENCES
	METRIC	IMPERIAL				
W15/	1	N69/1	Karearea	Pa	1961	Mabon 1961
W15/	9		Tupatika Pa site, Whakatane	Pa		McGovern-Wilson 1995b
W15/	33, 35		Tauwhare	Pa	1990	Bowers & Jones 1991
W15/	82	N69/87	Port Ohope	Midden		Moore 1972
W15/	121		Thornton			Shawcross 1965
W15/	123	N78/1	Tauanui	Pa	1963	Mabon & Pullar 1963a, b
W15/	580, 581		Ohiwa	Occupation		Phillips 1996
W15/	582		Tokitoki Ohiwa	Occupation		Phillips 1996
W15/	341, 342, 467, 473, 474, 475		Ohiwa Harbour	Pa, midden		K.J. Phillips 1999

Figure A2.1. Distribution of excavated sites in the Bay of Plenty region.



Appendix 3

RADIOCARBON DATES

A considerable number of radiocarbon dates have been obtained from samples from the Bay of Plenty region. Table A3.1 presents C14 dates that are available in the literature but not listed in the New Zealand Radiocarbon Database. Table A3.2 provides dates listed in the New Zealand Radiocarbon Database. Most samples are from archaeological contexts, but some are from other relevant contexts within the human occupation period. Figure A3.1 shows a map of the dated sites.

The site names are those presented in the sources, which are not a reliable source for traditional Maori names. The frequent identification of the surf clam *Paphies subtriangulata* in the list is suspect, as surf clams are not easily identified to species (of which there are more than one)—although this concern has no known consequence in using the dates. Older dated samples may be of charcoal that has not been identified to species. These are of limited use because of the unknown age of the wood at the time it was burned. More recent charcoal dates that have been identified to species have usually been screened for old wood.

TABLE A3.1. CARBON 14 AGES GIVEN IN THE LITERATURE THAT ARE NOT INCLUDED IN THE NEW ZEALAND RADIOCARBON DATABASE.

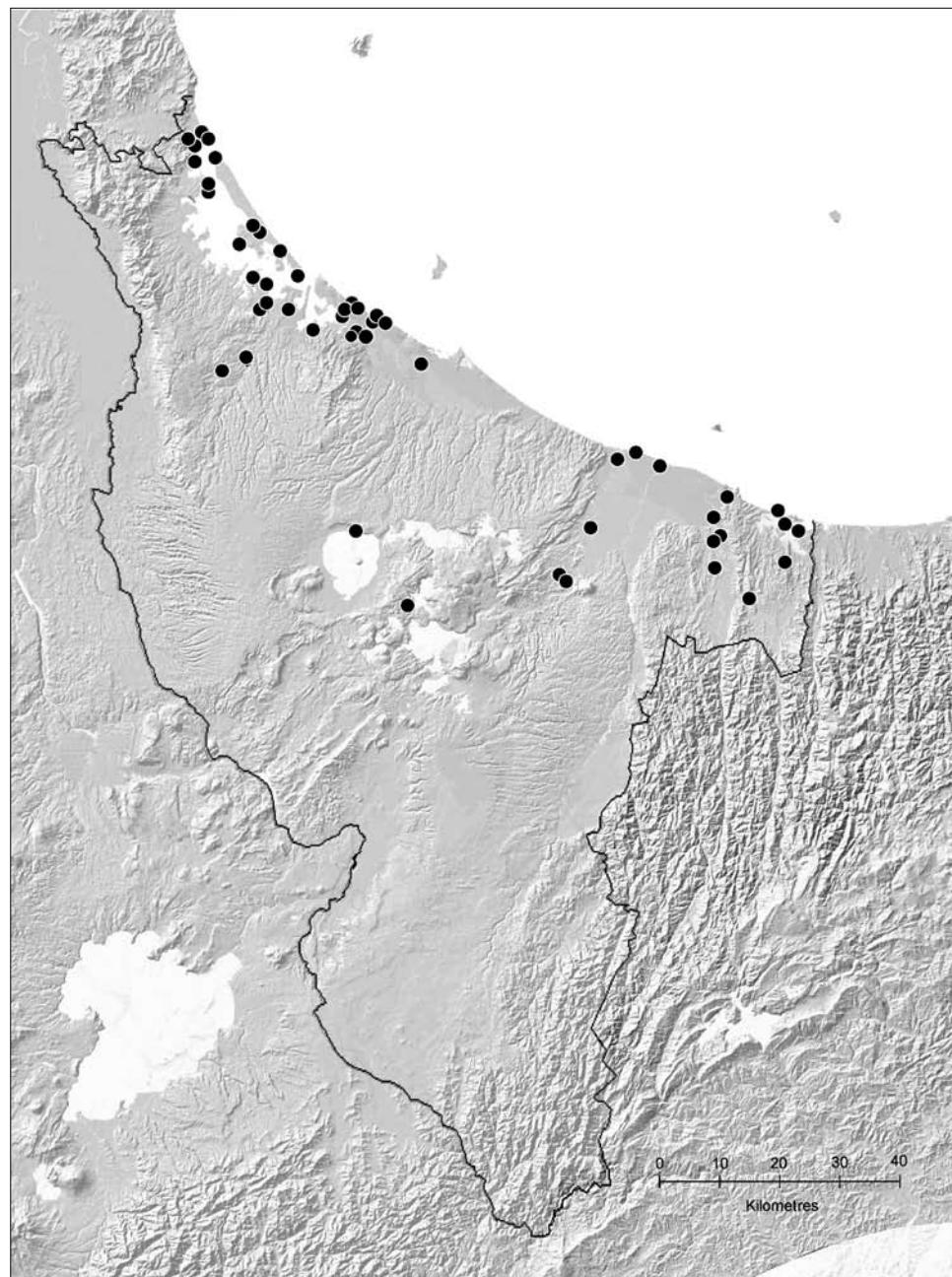
LAB NO.	REPORTED AGE ± ERROR (YEARS)	MATERIAL	SITE NUMBER	SITE NAME	CONTEXT
Wk4375*	890±50	Shell pipi (<i>Paphies</i> sp.)	W15/188	Gateway Midden	Bottom of layer 2.
Wk5480	†	Tuatua (<i>Paphies</i> sp.)	W15/584	Te Horo Drive, Ohope	South baulk of east-west trench.
Wk5481	‡	Tuatua (<i>Paphies</i> sp.)	W15/584	Te Horo Drive, Ohope	Eastern baulk of north-south trench.
Wk6571*	720±50	Tuatua (<i>Paphies</i> sp.)	U14/526	Pacific Grove Subdivision	
Wk6828*	580±40	Shell	U14/1712	Papamoa	Area B/1.
Wk6829	640±40	Shell	U14/1710	Papamoa	Strip 1.
Wk6830*	700±40	Shell	U14/2894	Papamoa	Area 6.
Wk6831	610±40	Shell	U14/2985	Papamoa	Area A1.
Wk7312(1)	570±45	Shell: oyster (<i>Ostrea</i> sp.)	U14/209	Tamapahore	From a pit in the lower layer on terrace B. Midden in pit fill, 0.5–0.8 m depth.
Wk7312(2)	550±40	Shell: oyster (<i>Ostrea</i> sp.)	U14.209	Tamapahore	This is a further date on a part of the same sample as above.
Wk7312(3)	590±40	Shell: oyster (<i>Ostrea</i> sp.)	U14.209	Tamapahore	This is a further date on a part of the same sample as above.
Wk9031*	620±50	Cockleshell (<i>Austrovenus stutchburyi</i>)	U14/2032	Grandview Estate Welcome Bay	-

* It is not clear whether these dates have had a marine reservoir correction applied to them.

† This has not been conventionally reported but is given by Phillips (1997) as being AD 1439–1566 (95 percentile data range).

‡ This has not been conventionally reported but is given by Phillips (1997) as being AD 1402–1501 (95 percentile data range).

Figure A3.1. Distribution of C14 dated sites (sites in the Recording Scheme only) in the Bay of Plenty region.



The presence of human bone in the materials does not represent modern archaeological practice. The samples reported here as containing this were all submitted by people other than archaeologists for forensic identification purposes.

The distribution of dated material naturally closely follows the excavated sites plot, but illustrates a concentration around Tauranga/Papamoa, where samples collected from mitigation excavations have frequently been dated.

TABLE A3.2. CARBON 14 DATES LISTED IN THE NEW ZEALAND RADIOCARBON DATABASE.

This table of dates was sourced from the New Zealand Radiocarbon Database (<http://waikato.ac.nz/nzcd/index.html>; viewed June 2008). More information on the dates can be found at that source. CRA is the conventional radiocarbon age in years. Note: dates in this table are presented without the reservoir correction that is routinely applied to shell and other marine-sourced sample ages; dates with reservoir correction are more commonly found in archaeological publications.

LAB NO.	CRA ± ERROR	MATERIAL	SITE NUMBER	SITE NAME	CONTEXT
ANU0025	495±78	Charcoal (unspecified)	U13/4	Kauri Point Pa	Sample from the first modified terrace on the pa.
ANU0026	230±70	Charcoal (unspecified)	U13/4	Kauri Point Pa	Square L29-30. Sample from a depression in the floor of the pit.
ANU0046	395±53	Charcoal (unspecified)	U13/4	Kauri Point Pa	Second shell midden, younger than the first defensive ditch.
NZ0592	404±59	Wood (unspecified)	U13/4	Kauri Point Swamp	Sample from the base of the archaeological deposit.
NZ0593	692±60	Wood (unspecified)	U13/4	Kauri Point Swamp	Sample from the upper part of the archaeological deposit.
NZ0809	285±59	Charcoal (unspecified)	U13/4	Kauri Point Swamp	Sample from the upper part of the archaeological deposit, directly below the swamp; equivalent of topsoil.
NZ0810a	616±60	Wood (unspecified)	U13/4	Kauri Point Swamp	Sample from 1 m beneath base of cultural deposits.
NZ0810b	597±49	Wood (unspecified)	U13/4	Kauri Point Swamp	Sample from 1 m beneath base of cultural deposits.
NZ0811	417±59	Wood (unspecified)	U13/4	Kauri Point Swamp	Sample from the base of swamp sediments.
NZ0812	435 ± 59	Charcoal (unspecified)	U13/4	Kauri Point Swamp	Sample from the base of the archaeological deposit.
NZ0813	553±82	Charcoal (unspecified)	U13/4	Kauri Point Swamp	Sample from the base of a cultural deposit, stratigraphically later than sample NZ0582.
NZ1129	207±43	Wood (<i>Leptospermum</i> sp.)	U16/83	Motuwhetere Island, Lake Okataina	Sample from palisade post, now submerged to depth of 22 feet.
NZ1897	469±57	Charcoal (unspecified)	U13/45	Kauri Point undefended site	Square A-3. Sample from immediately above the floor of Pit L, in the fill of the bin pit.
NZ3455	581±68	Moabone collagen (<i>Pachynornis elephantopus</i>)	-	Geological	
NZ4602	711±40	Shell (<i>Austrovenus stutchburyi</i>)	U14/38	Ruahihi Pa	Area G, Feature 18. Fill of palisade posthole ix, below pink layer.
NZ4603	714±32	Shell (<i>Paphies australis</i>)	U14/38	Ruahihi Pa	Shell midden 1, cooking area I, midden situated within topsoil.
NZ4604	796±33	Shell (<i>Paphies australis</i>)	U14/38	Ruahihi Pa	Sample from below bank of promontory pa. Sample located in buried topsoil.
NZ4605	529±32	Shell (<i>Paphies subtriangulata</i>)	U14/38	Ruahihi Pa	Area A, Feature 31. Rua. Cooking area III. Shells on top of stones in a rua within charcoally grey silt surrounding the stones.
NZ4659	672±32	Shell (<i>Paphies subtriangulata</i>)	U13/50	Roretana Block, Athenree	Shell midden M2. Shells mixed into cultivated soil.
NZ4660	778±33	Shell (<i>Paphies subtriangulata</i>)	U13/50	Roretana Block, Athenree	Shell midden M3, overlying cultivated ground.

Continued on next page

Table A3.2—continued

LAB NO.	CRA ± ERROR	MATERIAL	SITE NUMBER	SITE NAME	CONTEXT
NZ4700	639±27	Shell (<i>Paphies subtriangulata</i>)	U14/38	Ruahihi Pa	Shell midden 1, cooking area I. Midden located within topsoil.
NZ4800	352±56	Peat	V15/80	Kohika Swamp pa	Square D17. Sample from a layer of structureless peat [40–45 cm below Tarawera ash] containing: wood chips, stones, bracken, fresh water mussel.
NZ4801	534±56	Peat	V15/80	Kohika Swamp pa	Square D17. Sample from below a layer of structureless peat [65–69 cm below Tarawera ash] containing: wood chips, bracken, stone and shells.
NZ4802	727±57	Peat	V15/80	Kohika Swamp pa	Square D17. Layer of fine, grey silt 105–110 cm below Tarawera Ash.
NZ4803	675±84	Peat	V15/80	Kohika Swamp pa	Square D17. Sample in layer of brown silt, 130–132 cm below Tarawera ash.
NZ4804	654±56	Peat	V15/80	Kohika Swamp pa	Square D17. Sample from the bottom of a layer of Kaharoa Ash [145–146 cm below Tarawera Ash], in a fine white silt to coarse sand layer.
NZ5183	635±55	Shell (<i>Austrovenus stutchburyi</i>)	U13/44	Athenree pa	Shell lens in pit fill, under a defensive bank.
NZ5184	827±56	Shell (<i>Paphies</i> sp., <i>Austrovenus</i> sp.)	U13/46	Athenree pa	Shell lens in pit fill, under defensive bank.
NZ5185	665±55	Shell (<i>Austrovenus</i> sp., <i>Paphies subtriangulata</i> , <i>Paphies australis</i>)	U13/48	Athenree pa	Shell fragments in redeposited yellow tephra spoil, which was used to make defensive bank. The spoil was resting on buried soil under the bank.
NZ5186	668±55	Shell (<i>Paphies</i> sp., <i>Austrovenus</i> sp.)	U13/49	Athenree pa	Section 1—buried topsoil under defensive bank. Topsoil disturbed with streaks of yellow tephra and shells.
NZ5278	708±32	Shell (<i>Paphies subtriangulata</i>)	T13/31	Athenree pa	Sample from the interface between a layer of bracken fern soil above a layer of cultivated soil.
NZ5318	336±56	Charcoal (<i>Cyathea dealbata</i>)	V16/211	Maruka II, Kawerau	Terrace 4, Square K4, south face of pit feature. Feature contained a ponga post in the bottom.
NZ6069	429±75	Human bone	U16/-	Ohinemutu, Rotorua	Human remains found during excavations. Sample submitted by Rotorua hospital, no grid reference available.
NZ6202	716±55	Shell (<i>Austrovenus stutchburyi</i> , <i>Paphies australis</i>)	U14/428	Oikemoke Pa, Te Puna, Tauranga	Buried, cultivated topsoil. Sample mixed with topsoil under defensive bank.
NZ6203	350±32	Shell (<i>Austrovenus stutchburyi</i>)	U14/428	Oikemoke Pa, Te Puna, Tauranga	Shell midden on top of defensive bank.
NZ6204	755±40	Shell (<i>Paphies australis</i>)	U13/593	Kauri Point pit site	Lot II, Baulk VIII—shell lens in fill of pit.

Continued on next page

Table A3.2—continued

LAB NO.	CRA ± ERROR	MATERIAL	SITE NUMBER	SITE NAME	CONTEXT
NZ6205	730±33	Shell (<i>Paphies australis</i>)	U13/903	Kauri Point cultivated garden	Concentrated shell midden on top of cultivated soil.
NZ6206	708±32	Shell (<i>Paphies australis</i>)	U14/156	Hubbard's Pa, Wairoa River	Fill below the third terrace from the top of the pa.
NZ6207	590±32	Shell (<i>Paphies australis</i>)	U14/155	Te Puna, Tauranga	Fill below a terrace on the north side of the pa. Sample from a dense layer of pipi shells.
NZ6214	869±55	Shell (<i>Austrovenus stutchburyi</i>)	U14/332	Matakana Island	Old buried, mixed topsoil under defensive bank.
NZ6215	639±54	Shell (<i>Paphies subtriangulata</i>)	T13/716	Goymer's Pa, Athenree	Terrace riser near top of pa.
NZ6216	807±56	Shell (<i>Paphies australis</i>)	U14/153	Leef's Pa, Te Puna, Tauranga	Sample from the base of fill, below raised defensive platform.
NZ6237	683±28	Shell (<i>Paphies australis</i>)	U14/155	Te Puna, Tauranga	Shell midden located on the outer edge of a terrace on the south side of the pa.
NZ6241	581±54	Shell (<i>Austrovenus stutchburyi</i>)	U14/181	Matakana	Shells on top of buried topsoil below a defensive bank, Matakana Island.
NZ6244	772±32	Shell (<i>Paphies subtriangulata</i>)	T13/747	Athenree	Shell mixed with charcoal in cultivated soil.
NZ6304	89±54	Charcoal (<i>Melicytus ramiflorus</i> —dominant; <i>Hebe</i> sp.—minor; <i>Leptospermum</i> sp.—minor)	U14/177	Welcome Bay Oven, Umu-ti, 1.6 m in diameter and 0.9 m deep, containing rounded stones and a large quantity of charcoal.	
NZ6373	717±32	Shell (<i>Paphies subtriangulata</i>)	V16/220	Kawerau V	Terrace 6, Feature 113—mall depression at the base of layer III.
NZ6572	490±51	Peat	V16/238	Maruka, Kawerau	Sample taken from a natural peat section between layers II and VII within an old swamp on the flats adjacent to the pit and terrace site.
NZ6580	596±32	Shell (<i>Paphies subtriangulata</i>)	V15/80	Kohika	Area C—a zone of intensive cooking activity. Sample from a fire scoop in layer C.
NZ6583	212±32	Wood (<i>Leptospermum</i> sp.)	V15/80	Kohika	Area B. Sample of a palisade post that stood at perimeter of Kohika site, during major period of occupation.
NZ6599	159±42	Charcoal (unspecified)	V15/80	Kohika	Area A—the top of the Kohika mound. Sample from the lower fill of a kumara storage pit.
NZ6611	157±32	Wood (unspecified)	V15/80	Kohika	Area B. Sample of a palisade post removed during period of defended occupation.
NZ6618	221±32	Wood (unspecified)	V15/80	Kohika	Area D, Square DD. Sample of a house post associated with early artificial occupation floors
NZ6619	190±39	Bracken fern (<i>Pteridium esculentum</i>)	V15/80	Kohika	Area D, Square DD—a deliberately-laid floor of bracken fern, underlying a clay floor and midden.

Continued on next page

Table A3.2—continued

LAB NO.	CRA ± ERROR	MATERIAL	SITE NUMBER	SITE NAME	CONTEXT
NZ6662	684±32	Shell (<i>Paphies australis</i>)	U13/31	Te Kura a Maia, Tauranga	Shell lens within defensive bank.
NZ6688	747±28	Shell (<i>Paphies australis</i>)	U13/31	Te Kura a Maia, Tauranga	Sample from shell midden fill just below the highest platform on the pa.
NZ6692	599±32	Shell (<i>Paphies subtriangulata</i>)	U14/166	Wharo Pa, Tauranga	Shells forming the foundation of a terrace of the pa, terrace located below tiki on the north side.
NZ6703	524±32	Shell (<i>Paphies subtriangulata</i> , <i>Austrovenus stutchburyi</i>)	U14/242	Papamoa Pa No. 6, Tauranga	Sample from a grey soil layer under a defensive bank.
NZ6730	528±32	Shell (<i>Paphies subtriangulata</i>)	U14/125	Papamoa Pa No. 2, Tauranga	Fill below the highest platform on the pa. Sample from brown soil with lumps in indistinct lenses, with shell and charcoal.
NZ6747	504±54	Shell (<i>Paphies subtriangulata</i>)	U14/432	Papamoa No. 2, Tauranga	Fill below the highest platform on the pa. Sample from brown soil with lumps in indistinct lenses, with shell and charcoal.
NZ6752	585±28	Shell (<i>Paphies subtriangulata</i>)	U14/208	Mangatawa Pa, Tauranga	Dense-packed shell midden in fill, beneath platform, on the pa.
NZ6766	779±32	Shell (<i>Austrovenus</i> sp., <i>Paphies subtriangulata</i>)	U14/207	Mangatawa Pa No. 3, Tauranga	Sample in brown/yellow fill under tread of a major lateral terrace.
NZ6784	763±31	Shell (<i>Paphies</i> sp., <i>Austrovenus</i> sp., <i>Struthiolaria</i> sp.)	U14/238	Papamoa Pa No 1, Tauranga	Sample in yellow/brown soil fill, forming tread of lateral terrace on the pa.
NZ6791	777±33	Shell (<i>Austrovenus stutchburyi</i> , <i>Paphies australis</i> , <i>Paphies subtriangulata</i>)	W15/205	Hurst's Pa, Whakatane	Defensive bank of the pa at the western end. Sample from layer 5, which consists of oven stones, midden and subsoil fill, adjacent to the palisade line.
NZ6794	631±50	Shell (<i>Austrovenus stutchburyi</i>)	W15/126	Sisam's Pa, Whakatane	Sample from stock-eroded topsoil, in a bank above the western defences of the pa.
NZ6826	567±41	Shell (<i>Austrovenus stutchburyi</i>)	W15/144	Pa, Whakatane	Sample from recent colluvium, cut by road, below the defended area of the pa.
NZ6886	709±65	Shell (<i>Austrovenus</i> sp.)	W15/173	Pa, Matekerepu Historic Reserve, Ruatoki	Exposed midden on the western edge of the site. Shell in the topsoil of the platform pa.
NZ6894	713±28	Shell (<i>Austrovenus stutchburyi</i>)	W15/173	Pa, Matekerepu Historic Reserve, Ruatoki	Eroding midden. Shell in the topsoil of the platform pa.
NZ6901	587±48	Shell (<i>Austrovenus</i> sp.)	W15/173	Pa, Matekerepu Historic Reserve, Ruatoki	Sample from midden eroding inside the pa, beside the second ditch and bank system, from the southern end.
NZ7024	725±28	Shell (<i>Austrovenus stutchburyi</i> , <i>Paphies australis</i>)	U14/2240	Pa, Birch Avenue, Tauranga	Shell midden in lower part of topsoil, overlying cultivated soil.
NZ7045	602±48	Shell (<i>Paphies australis</i>)	U14/243	Pa, Papamoa, Tauranga	Shell midden overlying a filled-in defensive ditch.
NZ7046	616±48	Shell (<i>Paphies subtriangulata</i>)	U14/243	Pa, Papamoa, Tauranga	Shell lens in rua fill.

Continued on next page

Table A3.2—continued

LAB NO.	CRA ± ERROR	MATERIAL	SITE NUMBER	SITE NAME	CONTEXT
NZ7071	685±50	Shells (mixed species)	U14/2482	Midden, Welcome Bay, Tauranga	Midden (46), associated with cultivated ground and pit cooking area.
NZ7072	725±30	Shell (<i>Paphies australis</i> , <i>Austrovenus stutchburyi</i> , <i>Turbo smaragda</i>)	U14/2240	Pa, Birch Avenue, Tauranga	Shell midden in the fill of rua 4.
NZ7401	33±63	Charcoal (fern stems [probably bracken]—95%; Angiosperm—5%)	W16/226	Pleistocene Terrace Pa, Whakatane	Sample from soil in fill of defensive ditch. Sample derives from fern growing and burnt in the base of the ditch, rather than fill thrown or pushed in.
NZ7543	595±48	Shell (<i>Paphies subtriangulata</i>)	W15/121	Midden, Thomton Dune site, Rangitaiki Plains	Concentrated midden filling a pit dug into the original pumice topsoil cap of a sand dune.
NZ7546	194±48	Charcoal (twigs, probably <i>Leptospermum scoparium</i>)	V15/1193	Whites Drain B, Kawerau	Black ash and lapilli layer containing copious amounts of charcoal. Layer is interpreted as a garden soil.
NZ8100	183±39	Charcoal (unspecified)	U14/187	Ureturituri Pa, Matakana Island	Second period ditch and bank defence. Sample from the base of the cultural deposit, under the earliest bank of the three.
NZ8125	667±36	Shell (<i>Paphies subtriangulata</i>)	U14/	Hunters Creek Midden, Matakana Island	Hunters Creek Section, northwest end. Sample from a shell midden beneath wind- blown sand, resting on buried soil.
NZ8187	677±29	Shell (<i>Paphies subtriangulata</i>)	U14/	Hunters Creek Midden, Matakana Island	Hunters Creek Section, southeast end, shell midden No. 2. Sample from midden on buried topsoil, beneath the arm of a recent- looking parabolic dune.
NZ8311	751±37	Shell (<i>Paphies australis</i>)	U14/2823	Matakana Island	Shell midden, 2 m thick, exposed in a marine cut bank. Sample from 5-cm-thick layer of charcoal and burnt shell in sand.
NZA0300	605±143	Human bone	U16/-	Ngongotaha	Ground beneath old shed at Beaumonts Road. Sample submitted by the NZ Police.
NZA0301	751±254	Human bone	U16/-	Ngongotaha	Ground beneath old shed at Beaumonts Road. Sample submitted by the NZ Police.
NZA0302	338±147	Human bone	U16/-	Ngongotaha	Ground beneath old shed at Beaumonts Road. Sample submitted by the NZ Police.
Wk1218	0±0	Charcoal (unspecified)	U15/35	Pa, Hamurana, Lake Rotorua	
Wk1219	230±125	Charcoal (unspecified)	U15/35	Pa, Hamurana, Lake Rotorua	
Wk1220	280±50	Charcoal (unspecified)	U15/35	Pa, Hamurana, Lake Rotorua	
Wk1221	0±0	Charcoal (unspecified)	U15/35	Hamurana, Lake Rotorua	

Continued on next page

Table A3.2—continued

LAB NO.	CRA ± ERROR	MATERIAL	SITE NUMBER	SITE NAME	CONTEXT
Wk1222	0±0	Charcoal (unspecified)	U15/35	Hamurana, Lake Rotorua	
Wk1740	460±55	Charcoal (<i>Melicytus ramiflorus</i>)	V16/211	Maruka, Kawerau	Trench 9. Sample from hangi within layer Vie.
Wk1741	400±55	Charcoal (<i>Hebe</i> sp.)	V16/243	Maruka, Kawerau	Trench 2. Sample from possible firescoop within layer Vic.
Wk1742	360±55	Charcoal (<i>Hebe</i> sp., <i>Leptospermum scoparium</i>)	V16/220	Maruka, Kawerau	Terrace 6. Sample from a possible hangi (feature number 100) in the base of layer III.
Wk1743	520±80	Charcoal (<i>Cyathea dealbata</i> — 95%; <i>Phyllocladus</i> sp.—5%)	V16/220	Maruka, Kawerau	Terrace 6. Sample from a pit roof (Feature 181) at the base of layer III.
Wk1744	370±55	Charcoal (<i>Kunzia ericoides</i>)	V16/219	Maruka, Kawerau	Terrace 4. Sample taken from hangi (Feature 10) at the base of layer III.
Wk1745	350±55	Charcoal (<i>Cyathea dealbata</i>)	V16/219	Maruka, Kawerau	Terrace 4. Sample from large storage pit, measuring 11.84 m × 5.6 m × 2.4 m deep, within layer 5c.
Wk1765	670±45	Shell (<i>Paphies australis</i>)	W15/35	Tauwhare, Whakatane	Principal surviving earthworks of a major pa.
Wk2713	800±50	Shell (<i>Paphies australis</i>)	U14/539	Grant Place storm water pipeline, Papamoa	Trench 2—terrace/midden, sand layer 2—cultural layer.
Wk2714	540±50	Shell (<i>Paphies australis</i>)	U14/539	Grant Place storm water pipeline, Papamoa	Knoll A, lens B.
Wk2715	490±50	Shell (<i>Paphies australis</i>)	U14/539	Grant Place storm water pipeline, Papamoa	Area 2, knoll A, sand layer 2— sample from the floor of the cultural layer.
Wk2716	830±60	Shell (<i>Paphies australis</i> or <i>Struthiolaria papulosa</i>)	U14/539	Grant Place storm water pipeline, Papamoa	Hangi floor 1, Sand layer 3— cooking floor activity area in the sand dunes. Sample from the trench wall.
Wk2717	659±50	Shell (<i>Paphies australis</i>)	U14/539	Grant Place storm water pipeline, Papamoa	Trench 2—terrace/midden.
Wk3623	690±50	Shell (<i>Paphies subtriangulata</i>)	U14/1717	Royal Palm Beach, Papamoa	Area A—concentrated area with large midden scatter (c. 400 m ²), Midden 10, layer 2.
Wk3630	760±50	Shell (<i>Paphies subtriangulata</i>)	U14/1717	Royal Palm Beach, Papamoa	Area A, Midden 5, layer 2—shell midden consisting primarily of tuatua. Sample from a concentrated area within a large midden scatter.
Wk3631	820±50	Shell (<i>Paphies subtriangulata</i>)	U14/1717	Royal Palm Beach, Papamoa	Area A, Midden 13, layer 2— large midden scatter forming a 10–15-cm band below the turf.
Wk3632	760±50	Shell (<i>Paphies subtriangulata</i>)	U14/1717	Royal Palm Beach, Papamoa	Area A, Midden 15, layer 3— lower cultural layer 27–34 cm.
Wk3633	730±50	Shell (<i>Paphies subtriangulata</i>)	U14/1717	Royal Palm Beach, Papamoa	Area B, Midden 3, layer 2—large midden scatter forming a 10–15-cm band below the turf.

Continued on next page

Table A3.2—continued

LAB NO.	CRA ± ERROR	MATERIAL	SITE NUMBER	SITE NAME	CONTEXT
Wk3634	810±50	Shell (<i>Paphies subtriangulata</i>)	U14/1717	Royal Palm Beach, Papamoa	Area E, layer 2—large midden scatter forming a 10–15-cm band below the turf.
Wk3635	690±50	Shell (<i>Paphies subtriangulata</i>)	U14/1717	Royal Palm Beach, Papamoa	Area G, Midden 2, layer 2—large midden scatter forming a 10–15-cm band below the turf.
Wk3750	710±50	Shell (<i>Paphies australis</i>)	W15/9	Tupitika Pa, Whakatane	Subterranean storage pit that was used as a midden.
Wk3751	660±50	Shell (<i>Paphies subtriangulata</i>)	U13/46	Athenree	Palisade posthole from an early phase of pa development.
Wk3752	600±50	Shell (<i>Paphies subtriangulata</i>)	V15/1209	Robbie's Midden, Tarawera River	Sample from the base of a 50-cm-deep shell midden, at a depth of 70 cm below ground level in a 120-cm profile.
Wk3753	600±50	Shell (<i>Austrovenus stutchburyi</i>)	W15/363	Uretara Island, Ohiwa Harbour	Sample from a firescoop (at a depth of 60 cm) in a stratified midden on the northeastern end of the island.
Wk3754	660±50	Shell (<i>Paphies australis</i>)	W15/9	Tupitika Pa, Whakatane	Subterranean storage pit that was used as a midden.
Wk3755	720±50	Shell (<i>Paphies subtriangulata</i>)	U13/46	Athenree	Palisade posthole from an early phase of pa development.
Wk4189	800±50	Shell (<i>Paphies subtriangulata</i>)	U14/2841	Papamoa	Southwest Quad, Feature 57. Sample from below the layer 2 midden.
Wk4190	730±50	Shell (<i>Paphies subtriangulata</i>)	U14/2841	Papamoa	Southwest Quad, Feature 51—bin pit. Sample from shell fill.
Wk4191	840±50	Shell (<i>Struthiolaria papulosa</i>)	U14/2841	Papamoa	Trench A, Square I4, layer 2—midden, spit 1.
Wk4192	760±50	Shell (<i>Paphies subtriangulata</i>)	U14/2841	Papamoa	Southwest Quad, Square AE, layer 2—midden, spit 1.
Wk4493	750±40	Shell (<i>Paphies subtriangulata</i>)	U14/2844	Papamoa	Spreading unit I—sample from midden.
Wk4494	730±40	Shell (<i>Paphies subtriangulata</i>)	U14/2844	Papamoa	Spreading unit 1–2 Boundary—sample from midden.
Wk4495	710±40	Shell (<i>Paphies subtriangulata</i>)	U14/2844	Papamoa	Spreading unit 3. Sample from midden directly beneath topsoil.
Wk4645	740±50	Shell (<i>Paphies subtriangulata</i>)	U14/1720	Royal Palm Beach, Papamoa	Layer 2—large midden scatter forming a 10–15-cm band below the turf.
Wk4646	700±50	Shell (<i>Paphies subtriangulata</i>)	U14/2794	Royal Palm Beach, Papamoa	Layer 2—large midden scatter forming a 10–15-cm band below the turf.
Wk4647	810±50	Shell (<i>Paphies subtriangulata</i>)	U14/1796	Royal Palm Beach, Papamoa	Layer 2—large midden scatter forming a 10–15-cm band below the turf.
Wk4648	700±50	Shell (<i>Paphies subtriangulata</i>)	U14/1796	Royal Palm Beach, Papamoa	Layer 2—large midden scatter forming a 10–15-cm band below the turf.
Wk4649	690±50	Shell (<i>Paphies subtriangulata</i>)	U14/1796	Royal Palm Beach, Papamoa	Layer—large midden scatter forming a 10–15-cm band below the turf.

Continued on next page

Table A3.2—continued

LAB NO.	CRA ± ERROR	MATERIAL	SITE NUMBER	SITE NAME	CONTEXT
Wk4650	710±50	Shell (<i>Paphies subtriangulata</i>)	U14/2813	Royal Palm Beach, Papamoa	Layer 2—very large midden scatter 10–20 cm under the turf, covering the top and north-facing slope of a large dune.
Wk4651	740±50	Shell (<i>Paphies subtriangulata</i>)	U14/2813	Royal Palm Beach, Papamoa	Layer 2—very large midden scatter 10–20 cm under the turf, covering the top and north-facing slope of a large dune.
Wk4652	670±50	Shell (<i>Paphies subtriangulata</i>)	U14/2813	Royal Palm Beach, Papamoa	Layer 2—very large midden scatter 10–20 cm under the turf, covering the top and north-facing slope of a large dune.
Wk4653	720±50	Shell (<i>Paphies subtriangulata</i>)	U14/2814	Royal Palm Beach, Papamoa	Midden scatter containing several layers of shell, alternating whole and crushed material, some mixed with ash. Sample from layer 3—a lens of clean, whole tuatua shell.
Wk4654	680±40	Shell (<i>Paphies subtriangulata</i>)	U14/2814	Royal Palm Beach, Papamoa	Midden scatter containing several layers of shell, alternating whole and crushed material, some mixed with ash. Sample from layer 3—a lens of clean, whole tuatua shell.
Wk4655	670±50	Shell (<i>Paphies subtriangulata</i>)	U14/2814	Royal Palm Beach, Papamoa	Midden scatter containing several layers of shell, alternating whole and crushed material, some mixed with ash. Sample from layer 3—a lens of clean, whole tuatua shell.
Wk4656	660±50	Shell (<i>Paphies subtriangulata</i>)	U14/2814	Royal Palm Beach, Papamoa	Midden scatter containing several layers of shell, alternating whole and crushed material, some mixed with ash. Sample from layer 3—a lens of clean, whole tuatua shell.
Wk4659	670±50	Shell (<i>Paphies australis</i>)	U13/46	Anatere	Trench 4—undefended settlement. Sample from the terrace foundation, layer 9—soil and shell midden.
Wk4660	780±50	Shell (<i>Paphies australis</i>)	U13/46	Anatere	Area 4a—undefended settlement. Sample from a firescoop in layer 12.
Wk4661	700±50	Shell (<i>Paphies australis</i>)	U13/46	Anatere	Area 4a—undefended settlement. Sample from a shell lens in layer 7.
Wk4662	710±50	Shell (<i>Paphies subtriangulata</i>)	U13/46	Anatere	Trench 4—undefended settlement. Sample from the terrace foundation, layer 22—soil and shell midden.

Continued on next page

Table A3.2—continued

LAB NO.	CRA ± ERROR	MATERIAL	SITE NUMBER	SITE NAME	CONTEXT
Wk5259	810±50	Shell (<i>Paphies subtriangulata</i>)	U14/-	Royal Palm Beach, Papamoa	Area D, Midden 4—midden located on a compacted terrace/possible living floor. Sample from layer 4—compact dark grey/black loamy sand c.8cm deep.
Wk5814	770±50	Shell (<i>Paphies subtriangulata</i>)	U14/2860	Papamoa	Trench C—midden with garden soils. Sample from cultural layer 2.
Wk5815	850±50	Shell (<i>Paphies subtriangulata</i>)	U14/2860	Papamoa	Trench C—midden with garden soils. Sample from cultural layer 3.
Wk5816	820±50	Shell (<i>Paphies subtriangulata</i>)	U14/2860	Papamoa	Trench C—midden with garden soils. Sample from cultural layer 3.
Wk5817	710±50	Shell (<i>Paphies subtriangulata</i>)	U14/1722	Papamoa	Trench D—midden with garden soils. Sample from cultural layer 1C. Midden A, Trench B—midden with garden soils. Sample from cultural layer 2D.
Wk5818	640±50	Shell (<i>Paphies subtriangulata</i>)	U14/534	Papamoa	Midden A, Trench B—midden with garden soils. Sample from cultural layer 2D.
Wk6136	750±50	Shell: cockle (<i>Austrovenus stutchburyi</i>)	W15/-	Huirau Ridge, south of Ohiwa Harbour, Eastern Bay of Plenty	Midden, discrete lens within A horizon.
Wk7037	530±50	Shell: pipi (<i>Paphies australis</i>)	W15/582	Eastern side, Ohiwa Harbour, Eastern Bay of Plenty	Area A, sample 1 from section.
Wk7038	610±40	Shell: pipi (<i>Paphies australis</i>)	W15/582	Eastern side, Ohiwa Harbour, Eastern Bay of Plenty	Area A, sample 2 from section.
Wk7039	650±40	Shell: tuatua (<i>Paphies subtriangulata</i>)	W15/582	Eastern side, Ohiwa Harbour, Eastern Bay of Plenty	Area B, sample from section.
Wk7040	620±45	Shell: pipi (<i>Paphies australis</i>)	W15/582	Eastern side, Ohiwa Harbour, Eastern Bay of Plenty	Area C, sample from section.
Wk7041	600±40	Shell: cockle (<i>Austrovenus stutchburyi</i>)	W15/582	Eastern side, Ohiwa Harbour, Eastern Bay of Plenty	Area D, Square C10, layer 2.
Wk7042	560±40	Shell: cockle (<i>Austrovenus stutchburyi</i>)	W15/580	Eastern side, Ohiwa Harbour, Eastern Bay of Plenty	Sample No. 2 from section.
Wk7043	590±45	Shell: cockle (<i>Austrovenus stutchburyi</i>)	W15/581	Eastern side, Ohiwa Harbour, Eastern Bay of Plenty	Square B4, layer 3.
Wk7044	640±45	Shell: pipi (<i>Paphies australis</i>)	W15/581	Eastern side, Ohiwa Harbour, Eastern Bay of Plenty	Square B6, layer 2.
Wk7045	730±50	Shell: tuatua (<i>Paphies subtriangulata</i>)	W15/-	Ohope spit, Eastern Bay of Plenty	13 May 95, square 033, tuatua pocket layer 2, northeast corner of square.
Wk7046	800±50	Shell: cockle (<i>Austrovenus stutchburyi</i>)	W15/-	Ohope spit, Eastern Bay of Plenty	Square R30, layer 3.

Appendix 4

FAUNAL ASSOCIATIONS

Tables A4.1 and A4.2 present the animal species that have been recorded in association with archaeological sites in the Bay of Plenty region. In most cases, the association will indicate the use of the animals for food.

TABLE A4.1. FISH.

SITE	REFERENCE	BARRACOUTA <i>Thyrsites atun</i>	SNAPPER <i>Pagrus auratus</i>	TUNA <i>Thunnus</i> sp.	TREVALLY <i>Pseudocaranx dentex</i>	JACK MACKEREL <i>Trachurus novaezelandiae</i>	BLUE MACKEREL <i>Scomber australasicus</i>	MACKEREL SP.	KAHAWAI <i>Arripis trutta</i>	GURNARD <i>Chelidonichthys kumu</i>	FLOUNDER <i>Rhombosoidea</i> sp.	SHARKS/RAYS	SPOTTY <i>Notolabrus celidotus</i>	BLUE MAOMAO <i>Scorpaenichthys violaceus</i>	BLUE MOKI <i>Latridopsis cilatris</i>	RED COD <i>Pseudophycis burchus</i>	BLUE COD <i>Parapercis colta</i>	TARAKIHI <i>Nemadactylus macropterus</i>	JOHN DORY <i>Zeus faber</i>	HAPUKU <i>Polyprion</i> sp.	ESTUARINE STARGAZER <i>Lepidophanes macropygus</i>	LEATHERJACKET <i>Parika scalaris</i>
U13/46	Phillips & Allen 1996b	✓	✓	?	?	✓																
U14/2894	Hooker 1999b							✓														
W15/584	Bowers & Phillips 1997a			✓						✓	✓											
Matakana midden 8	Leach et al. 1994					✓	✓	✓	✓	✓	✓											
Matakana midden 10	Leach et al. 1994						✓				✓					✓	✓	✓				
Matakana midden 22	Leach et al. 1994										✓											
Matakana midden 27	Leach et al. 1994		✓	✓													✓	✓				
Matakana midden 35	Leach et al. 1994	✓							✓	✓	✓	✓	✓	✓	✓	✓	✓					
Matakana midden 38	Leach et al. 1994	✓							✓	✓	✓	✓	✓	✓								
W15/9	McGovern-Wilson 1995b	✓	✓		✓												✓	✓	✓			
W15/90	Grouden 1995	✓	✓						✓	✓	✓	✓							✓	✓		
U14/1945	Campbell 2004										✓											
Kohika V15/80	Irwin et al. 2004	✓	✓		✓	✓	✓			✓	✓				✓	✓		✓	✓	✓	✓	✓

TABLE A4.2. MAMMALS AND BIRDS.

SITE	REFERENCE										
W15/584	Bowers & Phillips 1997a	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
W15/9	McGovern-Wilson 1995b										
Matakana midden 38	Marshall et al. 1994b										
Kohika V15/80	Irwin et al. 2004	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
WHALE											
NZ FUR SEAL <i>Arctocephalus forsteri</i>											
POLYNESIAN RAT (PACIFIC RAT, KIORE) <i>Rattus exulans</i>											
DOG <i>Canis familiaris</i>											
PARAKEET <i>Cyanoramphus</i> sp.											
PIGEON <i>Hemiphaga novaeseelandiae</i>											
KAKA <i>Nestor meridionalis</i>											
PUKEKO <i>Porphyrio melanotus</i>											
KIWI <i>Apteryx</i> spp.											
BROWN KIWI <i>Apteryx mantelli</i>											
SCAUP <i>Aythya novaeseelandiae</i>											
BROWN TEAL <i>Anas chlorotis</i>											
GREY DUCK <i>Anas superciliosa</i>											
BANDED RAIL <i>Gallirallus philippensis</i>											
ALBATROSS SPP. THALASSARCHE, 3 DIFFERENT SIZES											
GREAT ALBATROSS <i>Diomedea</i> spp.											

Appendix 5

CULTURAL TOURISM AND ARCHAEOLOGY IN THE BAY OF PLENTY CONSERVANCY

By Jenny Cave and Garry Law

The Bay of Plenty area is one of the most remarkable in New Zealand in terms of the inseparability of culture from the natural landscape. It possesses a deep history of prolonged and intensive Maori heritage due to its rich climate, good soils, protected waterways and its primarily coastal approaches, which are both protected and isolated by the Kaimai-Mamaku Ranges. The region saw some early colonial settlements and Episcopal missions, and has experienced conflict and large-scale technological change. Its scenic beauty, wide range of endemic and introduced flora and fauna, and the cultural landscapes as evidenced by sculpted hillsides, sacred grounds, living spaces and built environments give the region potential for cultural, heritage, industrial and eco-tourism, as well as adventure and event tourism. This section will explore the actual and potential role of archaeological sites in cultural tourism in the Bay of Plenty area.

Cultural tourism is a niche form of tourism whereby cultural sites, events, attractions and/or experiences are marketed as primary tourist experiences. It often involves, if only for commercial reasons, the creation of purpose-built cultural attractions for tourists and the modification of, or provision of access to, everyday leisure and natural attractions in ways that create opportunities for tourists to encounter cultures that are ‘different’ from their own. These encounters are often carefully programmed to be short, authentic and controlled. Such cultural tourism attractions have grown in popularity over the last 20 years. There is a positive correlation between the development of facilities and tourism experiences that are targeted at tourists but also available for local residents (McKercher 2001; Boyd 2002).

In the context of New Zealand, cultural tourism has been defined as ‘domestic and international visitors engaging in experiences that are uniquely Aotearoa’, specifically those that ‘enable more depth of interaction with and understanding of our people, place and cultural identity, recognising that Maori is indigenous and unique to Aotearoa/New Zealand’ (Cultural Tourism Working Party 2000). New Zealand’s identity is strongly linked to a sense of place, and New Zealand depends upon the preservation and utilisation of its open landscapes, especially natural and cultural heritage landscapes, for its long-term economic future and to retain its cultural niche in the world. Even in the most populated places, New Zealanders want to be solitary occupants of beautiful, tranquil places—despite the fact that in many places a busload of tourists could arrive at any moment (Ryan & Cave 2005). It is also true that cultural tourism destinations can be overwhelmed with visitors, to the detriment of the experience. Beard & Ragheb (1980) suggested that the achievement of positive tourism experiences is strongly linked to a sense of belonging (that is identity) with a place. Many local authorities now include

preservation, care, lifestyle and aesthetics of the natural environment, and access to it, in their Community Plans (e.g. Taranaki, Hauraki, Taupo, Banks Peninsula, Southland, Nelson, Tasman and Westland).

Tourism has a multiplier effect that can be felt throughout a community (Collier 1999), as increased income for tourism businesses and public sector-funded tourism attractions results in increased money in local economies due to the influx of people from outside the region. Tourism is one of New Zealand's largest export industries. Tourism expenditure in New Zealand reached \$18.6 billion for the year ended March 2006, \$8.3 billion of which was spent by international tourists and \$10.3 billion by domestic tourists (comprising household, business and government) (Statistics New Zealand 2007b). Tourism-related industries are, however, subject to seasonal visitor flows and exogenous shocks that put people off travelling, e.g. the terrorist attacks of September 11 2001 or the SARS virus.

The Bay of Plenty area has a population of around 267 700 (6% of the New Zealand population). The median age is 2 years older than the national median of 36 years. Maori ethnicity is 13% higher than the national average. Population growth is projected to be negligible for the next 10 years (Statistics New Zealand 2007a). In 2006, visitor numbers to the Bay of Plenty reached 3.2 million per year (Ministry of Tourism 2007b). In 2007, the Bay of Plenty was New Zealand's fifth most popular domestic tourist destination, with a 5.8% share of the total nights spent in an area (Auckland was the most popular, with 13.3%). It also ranked sixth nationally in terms of favoured day trips (made mostly from the Waikato region) (Ministry of Tourism 2007a). The peak visitor season is summer (December–February) and the peak month is January, when numbers increase to 250 000; numbers then drop to around 60 000 in winter (Ministry of Tourism 2008). To cater for this large number of tourists, the region has many tourism infrastructure facilities such as hotels, motels, retail stores and cafes (Kelly 2003).

Cultural, heritage, agri-tourism and adventure tourism are burgeoning areas of tourism in the Bay of Plenty area, which is already well known for its eco-tourism charter fishing, diving and swimming with dolphins activities. There is potential for relationships with foreign tour wholesalers, the cruise ship sector (which utilises the deep water port) and backpacker tourist websites, to bring to the Bay of Plenty visitors from other countries who wish to experience a 'real kiwi' and 'authentic Maori' lifestyle (Cave et al. 2003).

Rotorua is one of the main centres of cultural tourism in New Zealand. Cultural assets and geothermal and volcanic features combine to form a node of cultural and environmental tourism in the greater Rotorua area. Tourism in the Rotorua area attracts and sustains other different, competing and complementary businesses, which also contribute to the economy of the area. The principal cultural attractions around Rotorua are the New Zealand Maori Arts and Crafts Institute, the model village at Whakarewarewa, the Tamaki Brothers' Maori Village, Ohinemutu, the Government Bathhouse/Rotorua Museum and Te Wairoa buried village. The latter is New Zealand's only commercial archaeological site and has recently added an award-winning interpretation centre.

The cultural aspect most presented at Rotorua is, of course, Maori, though interpretation at Te Wairoa covers the 19th-century European visitor experience, as do the exhibits at The Bathhouse. One art and craft operation—the Jade Factory—makes explicit links to the heritage of Maori carving of nephrite. The presentation of Maori culture at Rotorua has been criticised as being sanitised and popularised. The points of connection with the past generally relate to language, song, dance and traditional history, rather than to objects or sites from the past, the principal exception being the Rotorua Museum. Largely, though, the presentation is of a living culture, and the popularity of the products and the area means that this approach must be meeting a need. The Tamaki Brothers' Maori Village at Rotorua is based on 'authentic' recreations of indigenous performance arts, structures, customs, food and art/crafts repackaged for cross-cultural understanding and entertainment, which, although modern in their interpretation, are authorised by Maori elders and can therefore be considered 'authentic' (Ryan 2002). Authenticity of performance is the 'pull' that attracts visitors to the particular attractions (Cave et al. 2003).

Cultural tourism at Rotorua has a long history. Te Arawa sided with British forces during the New Zealand Wars and facilitated European access into its territories when other iwi that were opposed to settlement were resisting road construction. This led to the district being seen as one that was both safe to visit and easily accessible. Even before the arrival of the railway, tourists were visiting Rotorua through Tauranga (Town Wharf opened 1871) via the Oropi-Ngawaro road. Tourism reached new heights with the opening of the railway to Rotorua in 1894, which helped to overcome the loss of the famous Pink and White Terraces during the 1886 Tarawera eruption.

Archaeological heritage is presented and interpreted at the following five Department of Conservation sites in the Bay of Plenty area:

- Okere Falls power station, where the pioneer energy generation facility is presented.
- Galatea Redoubt sites, where there are well-presented interpretation boards.
- Tauwhare Pa, Ohope—a well-maintained complex of three pa, which have some visualisation of archaeological results, with posts standing in the sites of former posts that were revealed in excavation by postholes. The interpretive signs at this site have not been maintained to the original standard.
- Some of the Karangahake gold and silver mining and ore processing sites that are within the Bay of Plenty Conservancy area, though the better tracks and interpretation are across the river in the adjacent Waikato Conservancy, where the site complex is entered.
- The Waiorongomai Goldfield, where most of the archaeological remains are less accessible than at other locations, although there is good interpretation at the site entry.

Information about these sites is not readily available to visitors planning trips. The DOC website (www.doc.govt.nz) provides variable amounts of information about them, some of which is more oriented towards school parties. Little interpretation is provided at other non-DOC sources of

information. However, the booklets and leaflets available at the Whakatane Museum do form a good guide to the heritage features of that area, many of which are archaeological.

On the internet, the site <http://layout.co.nz> provides a comprehensive list of heritage attractions in the Bay of Plenty region; however, they are only briefly covered. The New Zealand Archaeological Association website www.nzarchaeology.org contains a section on Bay of Plenty archaeological sites for cultural tourists, with a comprehensive set of links. The sites covered there include:

- Te Kura a Maia Pa, Bowentown
- Te Kaputerangi—‘Toi’s Pa’, Kohi Point Walkway, Whakatane
- Te Koutu Pa, Okataina
- Te Wairoa—The Buried Village
- Papamoa Hills, Wharo Pa, Tauranga
- Galatea Redoubt, Murapara
- Gate Pa Battle Site, Tauranga
- Te Ranga Battle Site, Tauranga
- Monmouth Redoubt, Tauranga
- Mt Maunganui/Mauao
- Tauwhare Pa, Ohope
- Waiorongomai
- Okere Falls Power Station, Rotoiti
- Karangahake
- White Island Sulphur Works

The Historic Places Trust website has relatively little information about the Bay of Plenty area. The registered archaeological sites appear in the internet version of the Trust Register of Historic Places, but with only basic location information; and on the Trust website, none of the featured places to visit are in the Bay of Plenty area.

While brochures about individual heritage attractions are commonly displayed in hotels, motels, museums and the like, there appear to be no comprehensive guides to heritage assets of the region in leaflet or booklet form that are accessible to visitors. Accommodation providers often mention local attractions, but outside Rotorua heritage attractions get little exposure by this route in the Bay of Plenty area. Te Aroha and Katikati are the only towns in the conservancy that cultivate a heritage image (Porteous 1997).

A small number of tourism operators offer tours throughout the Bay of Plenty area. In the Rotorua area, many of these offer multi-site cultural tours of the region; however, none in the western Bay of Plenty specialise in this. Guides to White Island point out the sulphur mining remains to people on their tours.

Clearly, although the Bay of Plenty region has a great archaeological heritage, this asset is currently being under-utilised. Rotorua, with its existing visitor attractions, might seem to be a good place to develop an archaeological heritage aspect. However, many of the existing attractions are already

satisfying the cultural visitors' needs, and with the publicly-accessible archaeological sites in the area being generally less remarkable than elsewhere, they may be a difficult to develop further.

The concentrations of notable archaeological sites in other parts of the Bay of Plenty area, especially those clustered around Tauranga, provide likely alternatives for consideration. The tourism opportunities presented by the new regional park centred on the Papamoa pa complex and a proposed Tauranga Museum would be considerable if they were developed. The museum could be an integrating body for the heritage resources of the western Bay of Plenty rather than a stand-alone institution. It would not, however, include material relating to the eastern areas of the region.

Visitors to the Bay of Plenty area are predominantly domestic New Zealanders from the Waikato region (in a ratio of three to one), but international visitors make up a higher proportion of accommodation nights. Visitors are dominantly holidaymakers. This contrasts with the rest of New Zealand, where business and family travel are relatively more important. Tourism in the Bay of Plenty is localised by geography and travel time (2-3 hours by car from Auckland).

The total visits by all travellers to the Bay of Plenty area are forecast to increase by 1.1% per annum, to reach 3.45 million in 2013—an increase of 254 300. While these numbers appear large, 90% of the visitors are actually New Zealanders, and most of these are from the Waikato region, on holiday, visiting friends and relatives (49%) during 3 months of summer. International traveller numbers are small. Domestic business travel is smaller by comparison (under 6%) and foreign education students make up 3% of the international figure.

Domestic traveller numbers are expected to fall slightly (by 1.5%) over the next few years. They typically stay 3.2 nights with friends and relatives rather than in commercial accommodation. International visitor numbers are expected to increase from 8.3% to 9.8% in the next 7 years. Most come from Australia (35%) and the UK (23%) to visit friends and relatives (44%). On average, visitors stay 4.6 nights in the Bay of Plenty and spend \$153 per person per visit (Ministry of Tourism 2007b).

Recent research suggests that reliance on numeric counts of visitorship is no longer a reliable way to assess the impact of tourism on a region. Different visitor types have been identified as giving different 'yields' to the New Zealand economy. 'Coach tourists' bring the largest amount of money into an area per capita (simplistically, the amount spent per visitor per visit night). 'Free and independent travellers' who drive in private or rented cars and set their own timetables and visit agendas were the second highest spenders per head. 'Home visitors' spent the least amount of money in an area, while 'camping' and 'backpacker' tourists were medium spenders, ranking 3rd and 4th respectively (Becken et al. 2007). This information is important when considering the future of tourism in the region against the actual and forecast profiles.

As noted above, around 50% of visitors to the Bay of Plenty are 'Home Visitors', which is the lowest yielding tourist type in terms of 'new money' brought into the economy from outside; thus, the likelihood of domestic tourism itself netting extensive revenue is also low. Nonetheless, the

outdoors experience, rich cultural landscape and scenic beauty of the region might be leveraged to increase the proportion of international visitors to the area by encouraging ‘free and independent’ drivers to steer away from the main arterial routes; as well as encouraging walking, trekking and land-based sightseeing activities, which are preferred by over 80% of backpackers (compared to 66% of non-backpacker visitors) (Ministry of Tourism 2005). Events are also known to be a factor in the holiday decision-making of one in every four domestic holiday visitors (Angus & Associates Ltd 2007). A constraint for all international tourism planning, however, is the distance of the Bay of Plenty from Auckland (the main gateway to the country), the lure of Rotorua as a ‘must see’ destination, and distance from main arterial routes.

International tourism in the region centres on Rotorua. Tourists from Asia make up a higher proportion of visitors to this region than the average for the whole country. Geothermal and Maori cultural attractions feature highly in international visitor activities, but less so in activities of domestic tourists. This indicates that the greatest opportunity for increasing heritage visitation lies with the dominant car-borne domestic tourists, and in areas away from the already well-provided-for Rotorua area.

Much better use could be made of regional guides in internet and printed form. Better opportunity could be taken for themed road directional signage, inclusion of such information in GPS systems, interpretation at the sites and use of that interpretation to suggest other places to visit. Promotion of cultural visitation, environmental experiences and eco-tourism opportunities to tour operators and, particularly, accommodation providers is also likely to be beneficial.

However, caution should be exercised in the development of cultural tourism resources. Research in New Zealand and Australia has shown that people with a strong, purposeful interest in culture represent only about 3-7% of the total numbers who actually visit sites of cultural interest—the remaining visitors are motivated by reasons that range from simply accompanying others who express an interest, having somewhere to take children, or being there because it was part of an arranged itinerary, through to having an actual interest, but in a wider context than the simply cultural (Ryan & Huyton 2000, 2002; McKercher & du Cros 2002; Cave 2002; McIntosh 2004). A survey of domestic holidaymakers at Mt Maunganui showed that the top ten summer activities of choice were going to the beach, eating out, shopping for clothes, walking or hiking, visiting hot pools, swimming with dolphins, going on harbour cruises, shopping for sporting gear, taking chartered fishing trips and shopping for gifts. In contrast, visiting museums, art galleries and cultural heritage sites ranked much lower in the list (Kelly 2003).

When implementing cultural tourism, issues to be considered include:

- Who decides what is ‘authentic’, who presents authenticity, and who takes part—cultural communities, local governments, individuals and/or entrepreneurs?

- Does ‘authentic’ content mean an objectively ‘historical stopped clock’ undertaken by researchers; a cultural community ‘(re)constructed pre-colonial’ view of traditional cultural practices; or ‘contemporary culture’ authorised by community elders?
- Does authentic presentation mean that cultural tourists experience ‘real’ participation in language, custom and practice of family, spiritual and community life; themed ‘performance snapshots’; interpreted tours and short controlled encounters; information panels at venues or sites without human interaction; or interpreted visual experiences of archaeological heritage sites and other complexes?

Tourism as a sector is one of the few industries wherein supply can generate demand if its operation is imaginative, well-designed and efficient. For example, the world was not actually demanding a theme park based on Mickey Mouse, but the actualisation of Walt Disney’s vision has created one of the most visited destinations in the world (Wasko et al. 2001). Thus, it is possible for the most unlikely of products and locations to become successful if it is carefully researched, designed and advocated for as distinctive from other destinations.

