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KA PAKIHI WHAKATEKATEKA O WAITAHA: THE ARCHAEOLOGY OF CANTERBURY IN MAORI TIMES

by

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CONTENTS

TE PAKIHI WHAKATEKATEKA O WAITAHA

He wahi makuru (Ka Pakihi Whakatekateka-o-Waitaha) mo nga hua no to papa, nga hua no to moana me nga awa. Koina nga hua i kitea e nga Maori tuatahi i tau ai ki tenei rohe tata ki to timatatanga o tenei mano tau. I to rau tau tekau ma wha, me to rau tau tekau ma rima, ka nohia to whenua puta noa i to rohe. Apea ko Horomaka to nohonga pumau o to iwi. No o ratou nohoanga ki nga ngutu awa i etahi wahanga o to tau, ka taea e ratou nga rawa o to tuawhenua to mahi. Kua tau to ratou ohoanga ki runga i a ratou mahinga kai, to mahi whakangau, me to mahi kohikohi i nga hua o to whenua. A, ki etahi wahi, he nui to ratou mahi puta moa. Tae noa ki to rau tau tekau ma ono, he nui to wahi topetope, a ka ngaro haere etahi o a ratou mahinga kai. Kua tau o ratou nohoanga ki runga i to kaimoana o Horomaka me nga wahi patata tonu. Ka haere tonu o ratou heke ki nga mahinga kai puts noa i to motu. Na to makariri o to tonga, ehara to kumara i tetahi kai nunui ki tenei rohe, engari ka mahia to tikouka ke ki etahi wahi. I tohua to taenga mai o Ngai Tahu me Ngati Mamoe ki tenei rohe i to ran tau tekau ma whitu, e to rereketanga o a ratou taonga ki nga taonga e noho ngatahi ana i to taha o nga toenga moa, me nga taonga i kitea i muri mai e to Pakeha. Te ahua nei, ko nga pa kakari he mea hou.

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ABSTRACT

Canterbury offered abundant terrestrial, marine, and riverine food resources for its first Maori settlers, who arrived probably early in the present millennium. Occupation was widespread in the fourteenth and fifteenth centuries. Permanent settlement may have focused on Horomaka (Banks Peninsula). Seasonal occupation of river mouth locations provided access to the resources of the interior. The economy was based on diversified hunting and gathering, but moa-hunting was intensive in some areas. By the sixteenth century, substantial deforestation and some reduction in species availability had occurred. The settlement pattern probably reflected greater reliance on marine fishing and shellfishing on and near Horomaka. Seasonal hunting and gathering for a variety of foods continued over wide areas. Kumara horticulture was probably relatively unimportant in Canterbury because of climatic constraints, but other horticultural practices, particularly cropping of ti kouka (the cabbage tree), were significant in some localities. A distinctive intermediate phase of material culture occurred probably in the sixteenth and seventeenth centuries, between an early phase characterised by artefact types found in association with moa remains, and a late phase which included artefact types observed by early European visitors to New Zealand. Fortifications were probably mostly a late phenomenon.

1. INTRODUCTION

Archaeology is the study of material evidence surviving from the human past. The evidence may be obtained from field inspection (site recording), from excavation, and from the study of artefacts. The evidence relates to both time (chronology) and place (the past environment). Archaeologists construct explanations based on the evidence, particularly relating to subsistence, settlement, cultural sequence, and environmental effects. Such explanations are never final, but are revised in the light of further research.

1.1 Scope

This is a review of the archaeological evidence of the Maori occupation of the Canterbury region in pre-European times, within the boundaries of the Canterbury Conservancy of the Department of Conservation (about 48,500 sq km). It has been designed primarily for use by the conservancy and secondarily for use by students and others with an interest in archaeology and site protection. The main sources of data are the New Zealand

Archaeological Association file of over 1,000 archaeological sites recorded in the region during the past 40 years (Challis 1992), and reports of the investigation of over 10% of these sites by excavation or test pitting, a process which began over a century ago (e.g., Haast 1871, 1874a, 1874b, 1877; see also Trotter 1982: 86-89).

Archaeological sites recorded in Canterbury and classified as of Maori origin are predominantly middens, oven sites, and rock shelters (Challis 1992: 2-3). Their distribution (Figure 1) is mainly coastal, with some concentrations inland (mainly oven sites, rock shelters, and rock drawings) and a thin scatter elsewhere. Because of the relatively small numbers of earthwork sites (fortifications, pits, terraces, and horticultural sites) and their confinement to limited parts of the coastal zone, the Maori archaeological sites of Canterbury are comparatively less visible in the landscape than those in northern New Zealand (cf. Jones 1994).

However, since the beginnings of archaeological enquiry, evidence from Canterbury has been very influential nationally. The work of Julius Haast in the nineteenth century on sites of moa association at Rakaia River Mouth, Redcliffs, and Weka Pass, and Roger Duff in the twentieth century in defining the so-called Moa-hunter Period, has had the greatest impact. These and other people associated with the Canterbury Museum have carried out most of the field research in the region. Relevant doctoral theses have been by Wayne Orchiston (1974), who considered settlement patterns and artefacts, and Barry Fankhauser (1986a), who investigated the exploitation of ti kouka (the cabbage tree, *Cordyline australis*) in south Canterbury. The archaeology of Canterbury is of particular significance in the context of New Zealand archaeology generally, because of its contribution to the themes of subsistence (notably moa-hunting, kumara horticulture, and the exploitation of ti kouka) and environmental change (especially deforestation and species extinctions). It also has implications for some other current issues, namely the date of first settlement, the extent of regional distinctiveness, and the sequence of change in material culture. All these themes and issues are discussed in this review.

Despite the efforts of some individuals, no large parts of the Canterbury region have been intensively studied archaeologically, and most investigations have been small in scope or scale. Much field research remains unpublished. The information available for a synthesis is therefore fragmentary, diffuse, and often imprecise. As a result, important aspects of the past are not well understood. There are exceptions: umu ti (earth ovens used to cook ti kouka) in south Canterbury are well researched. However, most conclusions reached in this review would be extended and possibly overturned by further research.

It is recognised that the archaeological sites discussed here are culturally and historically significant to Maori people (Tau *et al*. 1990: 4.30-4.32). Extensive traditional, historical, customary, and ethnographic evidence of Maori settlement, subsistence, and culture is available (e.g., Leach 1969; Anderson 1988; Evison 1993; Beattie 1994). Written records became extensive from the 1840s (Anderson 1988: 27-39) and contribute to an understanding of Maori activity at that time. However, in order to limit the scale and clarify the focus of this review, knowledge of Maori occupation derived from such non-archaeological sources is not discussed in detail.

Figure 1 Distribution of recorded archaeological sites classified as of Maori origin (data from New Zealand Archaeological Association site recording scheme).

This presentation is organised in five chapters. Understanding of the general environmental and chronological context of Maori settlement in pre-European times is discussed in chapter 1. Various aspects of the themes of resource use and settlement are reviewed in chapters 2 and 3. These elements are drawn together in chapter 4 in a discussion of the apparent changes in settlement patterns, subsistence activities, and material culture which occurred over time. Chapter 5 presents a summary of conclusions.

1.2 Environment

Major changes in the Canterbury environment have taken place within the last thousand years. The effects of human activity on the environment have been extensive. General aspects of the Canterbury environment and the changes which have occurred are summarised

here. This provides a context for introducing the types of Maori archaeological site found in different parts of the Canterbury region.

A significant anthropogenic process related to archaeology in Canterbury is deforestation. By the time of the first European surveys (the 1840s and 1850s), Canterbury was deforested, except for wetter parts of Horomaka (Banks Peninsula; Evison 1993: 1) and inland north Canterbury and small forest remnants on the plains and foothills (McGlone 1989: fig. 2). However, forests were once extensive. They had left fallen logs, hollows and hummocks indicating wind damage, buried charcoal indicating fire, and types of soil which develop under forest (Molloy *et al.* 1963: 69). Analysis of pollen cores from Canterbury sites has consistently shown an abrupt onset of deforestation, marked by a sharp decline in forest tree pollen and a corresponding increase in bracken, grass, and shrub spores and pollen, associated with evidence of slope instability such as increased rates of bog-filling (McGlone 1983: 15-16; Anderson and McGlone 1992: 220).

Radiocarbon dating of charcoal and wood samples relating to these events has shown that the deforestation mainly occurred within the last millennium, in the period of human settlement (Anderson and McGlone 1992: 218). Changes in climate in this period have been postulated (Grant 1994), but these variations were not sufficient to cause such widespread permanent ecological changes (Molloy 1969). In drier areas, natural fires may have reduced the forest to a more open patchwork including shrubland and grassland before first human settlement. These fires, presumably resulting from lightning, may have become more frequent in periodically drier conditions during the last three thousand years (Anderson and McGlone 1992: 207). Periodic weather cycles bringing gales, flooding, erosion, and alluviation probably affected exposed and vulnerable areas (Grant 1994: 166-175, 188-189). Nevertheless, large forested areas were probably substantially unaffected until the widespread deforestation which occurred within the last thousand years (McGlone *et al.* 1994: 146).

Radiocarbon dates (Appendix l. l) from buried forest soils in the Rakaia catchment focus in the fourteenth century (NZ 5197-NZ 5199, NZ 5366; McGlone 1983: 14). Dates from fire charcoal from the Cass locality in the Waimakariri catchment focus a little later, in the fourteenth and fifteenth centuries (NZ 304, NZ 391, NZ 655-NZ 660, NZ 662, NZ 4962; Molloy 1977: 161; McGlone 1983:14). Some charcoal dates relating to fire on the Canterbury Plains are of a similar period (e.g., NZ 382; Cox and Mead 1963: 35). These dates are consistent with a general national pattern of extensive deforestation in the fourteenth to the sixteenth centuries (Anderson and McGlone 1992: fig. 8.4). However, some dates relating to forest burning, such as those from West Melton and Yaldhurst, west of Christchurch, are several hundred years earlier (NZ 429 and NZ 434; Cox and Mead 1963: 33-34). These two dates are from matai trees and, like some other dates from charcoal or wood, have an unknown inbuilt age of perhaps several centuries, resulting from the long-lived timber.

It cannot be determined whether the fires which particular radiocarbon dates represent were anthropogenic, either substantially accidental or deliberate, or were caused naturally. However, it is a widely accepted general conclusion that increased forest fire frequency early in the present millennium was associated with human arrival (McSaveney and

Whitehouse 1989: 155; Anderson and McGlone 1992: 218). More controversially, it has been suggested (McGlone *et al.* 1994: 154) that widespread fires around the fourteenth century may represent a deliberate strategy to increase food production, by establishing larger areas of good quality regenerating browse favoured by moa, creating swamps, lakes and lagoons in place of forested wetlands to attract waterfowl, and encouraging the spread of aruhe (bracken fern, *Pteridium esculentum*).

On the Canterbury Plains (Ka Pakihi Whakatekateka o Waitaha; Evison 1993: xiv), on older better-drained soils, the pre-human vegetation was lowland conifer-broadleaf forests, dominated by matai (*Prumnopitys taxifolia*), kahikatea (*Dacrycarpus dacrydioides*), and totara (*Podocarpus totara*). On younger drier interfluves there were tall shrublands of karamu, kanuka, manuka, and pohuehue (*Coprosma* sp., *Leptospermum ericoides, L. scoparium* and *Muehlenbeckia* sp.). Braided river margins prone to flooding carried shrubland and grassland. There were extensive swamps, particularly south of the Rakahuri (Ashley) River, west of Horomaka (Banks Peninsula), north of the Rakaia River, and between the Hakatere (Ashburton) and Rangitata Rivers (Leach 1969: map 5; McGlone 1989: 116; Worthy 1990:230). However, by 1840, forest remnants occupied less than 1% of the plains, and shrubland remnants about 10% (Cox and Mead 1963: 33-35).

Maori activity on Ka Pakihi Whakatekateka o Waitaha (the Canterbury Plains) is indicated by substantial numbers of oven sites and find spots of stone implements. These have been recorded particularly adjacent to the distributary channels of the major rivers (e.g., the Waimakariri) and around the swampy areas between the Hekeao (Hinds) and the Hakatere Rivers and west of Waihora (Lake Ellesmere; see Figure 12). It is thought that much of this activity may have related to the gathering of plant foods, but no sites have been investigated in sufficient detail, and few survive.

In the foothills and the downlands, conifer-broadleaf forests predominated before human arrival, with tawhai forest (beech, *Nothofagus* spp.) on the higher inland parts of north Canterbury (McGlone 1989: fig. 1). During the period of Maori settlement before European arrival, the south Canterbury downlands had become predominantly grassland with ti kouka (cabbage trees) and aruhe (bracken; Moar 1971: 86). Forest remnants survived near Waimate and further north at Peel Forest and Alford Forest. Pollen diagrams from the north Canterbury downlands show dramatic increases in grass pollen frequencies (e.g., Moar 1970: 460), but some bushed valleys may have survived between the drier hillsides (Trotter 1972b: 49). The wetter foothills north of the Waimakariri River were not so extensively deforested.

Maori activity in the downlands and foothills has left distinctive archaeological evidence. In the downlands of south Canterbury, rock shelter sites, rock drawings, and umu ti sites are numerous (see Figures 12 and 16). In the north Canterbury downlands, rock shelter sites and rock drawings again predominate, with isolated ovens and artefact finds. Oven sites have been recorded near the margin of the foothills with the plains, notably in the Homebush area. Quarry sites for silicified tuff and silcrete have been identified at Gawler Downs near Mt. Somers and at Miro Downs near Oxford.

Further inland, in the driest districts of the inter-montane basins and valleys of central and south Canterbury, close to the Southern Alps, a distinctive inland conifer-broadleaf forest type once existed, of toatoa (*Phyllocladus alpinus*), mountain totara (*Podocarpus hallii*), and small hardwood trees. This forest type was highly vulnerable to fire, and was nearly eliminated early in the human settlement period. Its place was taken by tussock and sub-alpine plants (McGlone 1989: 116-121).

Archaeological sites of Maori origin located in valleys, basins, and foothills are usually at less than 700 m above sea level. Notable are the Grays Hills silcrete quarry site, and rock shelters and rock drawings in the Waitaki Gorge and at Castle Hill. The majority of investigated sites in the Waitaki Gorge, the Mackenzie Country, and other inland basins are of early types relating to moa-hunting (Trotter 1977: 360). The depletion of flora and associated fauna is thought to have left the inland plains with reduced utility to the Maori (Ambrose 1968: 592). The use of trans-alpine passes is indicated by occasional artefact finds (e.g., Arthur's Pass; Jacomb 1990; see also Brailsford 1984).

Maori occupation sites in Canterbury were concentrated in the coastal zone, where food resources were most varied and abundant and where the climate was more benign. Horomaka (Banks Peninsula) provided the most extensive estuarine systems and the widest array of shellfish and fish resources. Many archaeological sites are clustered in and around the numerous bays, notably pit sites and fortifications on the low but steep hills, and horticultural sites on sheltered slopes. North and south of Horomaka, the ponding of rivers and streams behind coastal bars created numerous lagoons and estuaries. Such river and stream mouths were favoured early settlement locations, both on the steep coastlines north of the Waipara River, and on the low gravel coasts of Tai O Arai Te Uru (south Canterbury). They are characterised by midden and oven sites, often associated with moa-hunting.

Substantial environmental changes have occurred in the coastal zone of Canterbury over the last thousand years. Most river mouths were affected by flooding and sediment deposition (Grant 1994: 183-184). For example, the Waimakariri River reoccupied old courses linking with the Otakaro-Opawaho Estuary (Avon-Heathcote; Evison 1993: 40), adjacent to the archaeological site at Redcliffs Flat, in the thirteenth or fourteenth century (Cox and Mead 1963: 31-32; NZ 312, wood buried by floods; Appendix 1.2). On the gravel coasts of Tai O Arai Te Uru (south Canterbury), from 5 km east of Taumutu southwards to the Waitaki River, vigorous marine erosion has occurred (rates from 0.38 to 1.2 m per year in the European period; Gibb 1978: 448-449) and has contributed to the progressive loss of coastal moa-hunting sites. In contrast, on the Kairaki coast from the Otakaro-Opawaho Estuary northwards to the Rakahuri (Ashley) River, many midden and oven sites lie on stabilised sand dunes protected behind the accumulation of unstable modern coastal dunes (McFadgen 1985: 37; see Figure 9). Waihora (Lake Ellesmere) had a higher surface level in the pre-European period (Armon 1974: 70).

On a regional level, the general outlines of the processes of deforestation and coastal change in Canterbury in the last thousand years are known. However, in most cases the relationships of particular archaeological evidence to these processes have not been defined. It is possible to draw more detailed conclusions about Maori use of some species of fauna and flora. These are discussed in chapter 2.

1.3 Chronology

The dating of archaeological and environmental evidence is of great importance. Without some understanding of the times when certain activities were current,; it is impossible to identify changes in subsistence, settlement, or material culture. Dating is difficult in New Zealand archaeology because the time span of human settlement was comparatively short. Since the beginnings of archaeological enquiry, the principal means of establishing relative chronology have been the evidence of successive stratigraphic deposition (as studied by Haast, e.g., 1874b) and the evidence of typological change of artefacts (recently reviewed in Jacomb 1995; see chapter 4.3). In recent decades, radiocarbon dating has provided increasingly precise indications of absolute chronology (relating to calendar years). The radiocarbon dates from Canterbury archaeological sites require introductory explanation.

Canterbury archaeological radiocarbon dates (Appendix 2) include two main groups. First, over 40 dates were obtained prior to 1975 from samples taken from a range of sites by the Canterbury Museum. These samples were submitted for dating in order to determine the age of early settlement, and also for the purposes of research into the suitability of various materials for radiocarbon dating. For example, series of samples of different materials were submitted from Redcliffs Flat and the adjacent Moa-bone Point Cave, from Rakaia River Mouth, and from Woolshed Flat at Aviemore (Trotter 1972c). Second, 34 charcoal samples from umu ti in south Canterbury were submitted for dating in 1982 (Fankhauser 1992). The intention was to date the ovens, and also to test the inbuilt age of radiocarbon dates derived from charcoal or wood samples, by comparison with dating of the same ovens by thermoluminescence (discussed below). Few samples have been submitted for radiocarbon dating from Canterbury in the past ten years, except for those from Killermont No. 2 in the Ahuriri Valley (3 dates), and those from two sites on Horomaka (Banks Peninsula): Tumbledown Bay (Te Kaio; 7 dates) and Panau (5 dates).

Radiocarbon dates from wood and charcoal have been found to be older than dates from marine shell or moa bone collagen from equivalent contexts, probably largely as a result of the inbuilt age of long-lived or long-dead timber (e.g., NZ 1535, Pentland Downs; NZ 1533, Glen Gynk; NZ 438, Redcliffs Flat; NZ 783, NZ 798, Woolshed Flat; Trotter 1968: 87; 1975b: 204). Before 1976, charcoal samples were rarely identified by species or longevity, so all such dates may include substantial inbuilt age. Comparison of thermoluminescence dates with radiocarbon dates from charcoal samples from south Canterbury umu ti demonstrated the problem of inbuilt age convincingly (Fankhauser 1992: table 4). The charcoal dates from long-lived species were 200 to 300 years older than thermoluminescence dates from the same ovens (NZ 6167, NZ 6168, NZ 6173, NZ 6230), but charcoal dates from small stems from short-lived species were closely comparable with thermoluminescence dates (NZ 6170, NZ 6212; see Appendix 2). It was concluded that radiocarbon dating of long-lived species was pointless (Fankhauser 1986a: 83). Dates from unidentified or long-lived charcoal or wood samples have therefore been discarded in recent analyses (e.g., Anderson 1991: 782).

Early in the experience of radiocarbon dating in Canterbury it was also recognised that some other materials provided unreliable results. In particular, moa bone carbonate gave wildly variable results by comparison with other materials from the same contexts (e.g., NZ 917, Timpendean; NZ 927, NZ 929, NZ 931, Rakaia River Mouth; NZ 1112, Redcliffs

Flat). Freshwater shell results also appeared unreliable (e.g., NZ 893, Timpendean; NZ 1160, NZ 1161, Hohoupounamu; Trotter 1972b: 40). Faunal samples of all kinds occasionally returned dates indicative of natural pre-human origin (e.g., NZ 918, Timpendean; NZ 1200, Hohoupounamu; SUA 64, Waihao River Mouth). Soil or ash deposits were found to be unsuitable for dating (e.g., NZ 461, Moa-bone Point Cave; NZ 4544, Waitaki River Mouth). Results from such materials have also been discarded in recent analyses (for explanation, see Anderson 1989a: 171-173), but are included in Appendix 2 to provide a full record.

Selected Canterbury archaeological radiocarbon dates are presented in Figure 2 in three groups: moa bone collagen (13 dates), marine shell (14 dates), and wood and charcoal (26 dates). Samples thought to be of pre-human origin, materials regarded as unreliable, and wood and charcoal samples of long-lived species or processed before 1976 are excluded. (Nevertheless there is likely to be variable inbuilt age in the illustrated wood and charcoal results, and there are uncertainties associated with the other materials.) It is assumed that the illustrated ages, taken as a group, might be indicative of general chronological trends in the Maori occupation of Canterbury, even though individually each date may not be representative of the full time span of occupation at the site from which it was derived. The radiocarbon ages of samples at the early end of the range indicated on Figure 2 exhibit a remarkable degree of unanimity in suggesting the widespread presence of Maori activity in Canterbury in the fourteenth and fifteenth centuries.

The two samples notably earlier than the rest are NZ 1534 (tenth to fourteenth century), from marine shell excavated from a floor deposit at the Pentland Downs rock shelter near Weka Pass, about 20 miles from the coast, and SUA 62B, from moa bone collagen from an oven at Waihao River Mouth in south Canterbury (eleventh to fourteenth century; note a charcoal date from the same oven, SUA 63, thirteenth to fourteenth century). The 95% confidence intervals of NZ 1534 and SUA 62B include the fourteenth century, so they are not inconsistent with the general trend. On statistical grounds, such early outliers to a trend should be expected. A peak in the frequency of radiocarbon dates from charcoals attributed to fires causing deforestation in Canterbury also occurs in the fourteenth century (see chapter 1.2; dates subject to inbuilt age).

These radiocarbon dates from Canterbury archaeological sites indicate widespread activity in the fourteenth and fifteenth centuries, at river mouth sites (eg. Hurunui, Redcliffs Flat, Rakaia, and Waitaki) and inland (eg. Killermont No. 2; Woolshed Flat at Aviemore; and south Canterbury umu ti sites, Tengawai, Mt Parker, Wainui, Te Mako, and Brunswick Downs). Occupation in this period is described in this paper as early, and is frequently characterised by association with the moa. Archaeologists have applied the terms Moa-hunter Period and Archaic Phase to the early period with particular reference to artefact types found with moa remains (Duff 1956; Golson 1959; Davidson 1984: 7-9; discussed in chapter 4.3).

For Maori activity to have expanded to a stage which can be so well defined archaeologically, an earlier initial colonising settlement period of long or short duration would be expected, during which time an increase in the small or large founding population would have occurred. The radiocarbon dates may not be representative of this initial

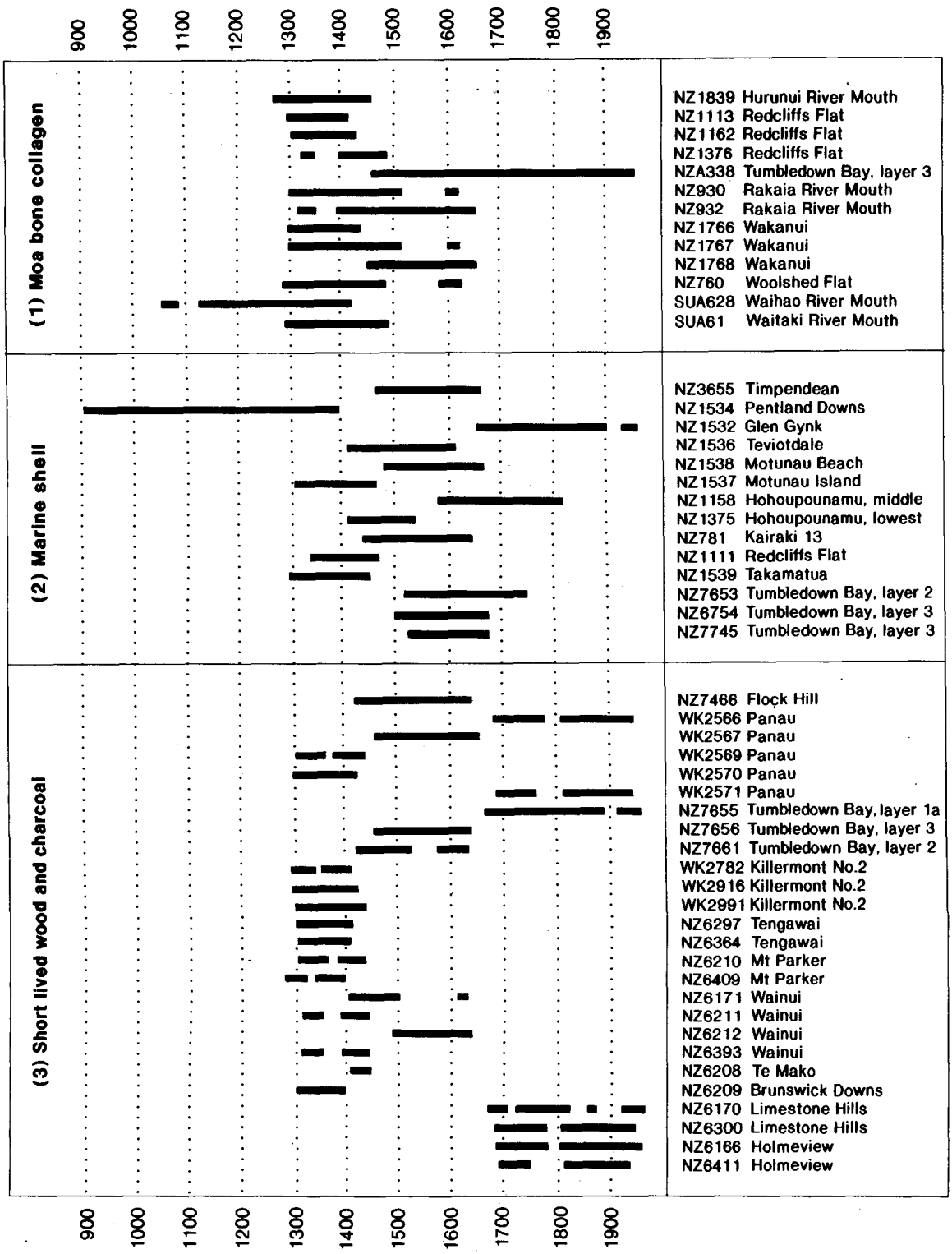

Figure 2 Selected Canterbury archaeological radiocarbon dates (data in Appendix 2).

settlement period. Conservatively, it is considered fairly certain that settlement had begun by the twelfth century (Anderson and McGlone 1992: 215).

There are relatively few radiocarbon dates relating to the period after about 1700 AD (Figure 2). Occupation in this period is described in this paper as late. Archaeologists have applied the terms Maori Period and Classic Maori Phase to the late period with particular reference to artefact types observed by early European visitors to New Zealand (Duff 1962; Golson 1959). The fewer dates do not indicate a reduced scale of occupation compared with an apparent heyday of earlier expansion in the fourteenth to fifteenth centuries. They are a result of the tendency of archaeologists to more frequently investigate and submit radiocarbon dating samples from apparently early sites and from the earliest identifiable layers in sites, particularly those associated with moa-hunting.

The classification of the archaeological evidence of the pre-European Maori into two extremes, the early (the so-called Moa-hunter Period or Archaic Phase) and the late (the so-called Maori Period or Classic Maori Phase), has been criticised on the grounds that it polarises the evidence and hinders recognition and explanation of change (Davidson 1984: 223). Evidence from Canterbury calls this classification into question, and suggests that there was a definable intermediate phase (Jacomb 1995; see chapter 4.3).

2. RESOURCE USE

The subsistence patterns and technology of the Maori have been major preoccupations of archaeological enquiry in Canterbury. The hunting of the moa and the use of stone tools have been prominent themes. Midden analysis suggests that the proportions of different foods such as moa, other birds, marine mammals, fish, and shellfish varied from site to site and over time (see Table 1). There is little information about kumara horticulture. This activity was of considerable importance in northern New Zealand, but Canterbury was the region in which increasing latitude forced its abandonment. There is some evidence to suggest that other horticultural practices (e.g., cropping of ti kouka, the cabbage tree) were important.

2.1 Moa-hunting

Moas and moa-hunting have long been a focus of interest and speculation in Canterbury. Moa remains have been identified, in association with Maori activity to a greater or lesser degree of certainty, at over 60 sites (Figure 3, Appendix 3; reviewed in Anderson 1989x: 126-134, 141-143). Many sites are not well documented and few have been scientifically investigated. In some cases there may have been confusion between naturally deposited moa bone and egg shell, and the remains from human predation, particularly in rock shelters, which were a favoured nesting habitat.

The identification of moa species has also been of uncertain reliability (Worthy 1990: 223-225). Early taxonomy was largely based on measurement, but size ranges are known to overlap, and it is difficult to distinguish some species, especially from fragmentary bones. Archaeological remains are usually fragmentary, so there may have been many misidentifications. In particular, it is likely that *Euryapteryx geranoides* and *Anamalopteryx*

Table 1 Bones in archaeological deposits (%).

	moa	other bird	marine mammal	dog	fish
Wakanui (% by weight)	87	<1	8	<1	4
Rakaia, first excavation (% by weight)	>99	<1	<1	<1	–
Redcliffs Flat, kitchen middens (% by number)	41	26	24	9	–
Redcliffs Flat, Hamilton's deposit (% by number)	28	9	61	2	<1
Moa-bone Point Cave, lower deposits (% by number)	29	31	34	3	3
Moa-bone Point Cave, upper deposits (% by number)	–	34	17	10	39

References:
Wakanui: notes, Wakanui box, cupboard 3, Canterbury Museum
Rakaia River Mouth: Trotter 1972x: 148
Redcliffs Flat, kitchen middens: Haast 1874x: 85
Redcliffs Flat, Hamilton's deposit: Dawson and Yaldwyn 1975: 214
Moa-bone Point Cave: Haast 1874x: 83, 84

Figure 3 Distribution of identified moa remains probably in human association (data in Appendix 3).

didiformis have been over-estimated and *Pachyornis elephantopus* and *Emeus crassus* under-estimated (Worthy 1990: 225-226; 1994). Rigorous reassessment of the human association of moas at poorly documented sites, and re-identification of bones in existing collections, could alter the present understanding. The published identifications listed in Appendix 3 should be regarded as an interim indication.

Seven moa species have been identified from Canterbury archaeological sites (Anderson 1989a: 219-221; Worthy 1990: 221-233). The eastern lowland environment, of drier open forests and shrublands with margins to adjacent swamps and braided streams, was a preferred habitat of *Emeus crassus* (eastern moa, predominant at Rakaia River Mouth and Redcliffs Flat; Worthy 1990: 223-224, fig. 3; and identified at other coastal sites)

and *Dinomis giganteus* (giant moa, identified only at Redcliffs Flat and Moa-bone Point Cave). *Euryapteryx geranoides* (stout-legged moa) preferred open forests and shrublands on low hill country (frequently identified at coastal sites, predominant at Waitaki River Mouth, and identified inland at Waitaki Gorge sites and at Timpendean rock shelter in north Canterbury). *Pachyomis elephantopus* (heavy-footed moa) preferred wetland-forest-shrubland mosaics (identified at coastal sites and also at Waitaki Gorge and south Canterbury downland sites). These four species correlate with shrublands, the primary moa-hunting environment (Anderson 1989a: 7). In contrast, *Anomalopteryx didiformis* (little bush moa) and *Dinornis novaezealandiae* (large bush moa) occupied dense wet lowland forests and have been identified only at coastal sites including Horomaka (Banks Peninsula). (Most Canterbury identifications of *A. didiformis* may be errors: Worthy 1994.) *Megalapteryx didinus* (upland moa) occupied upland forest and grassland habitats, and has been recorded only at Waitaki Gorge sites.

Although the quantity of moa bones identified at most sites is either undocumented or small, on some coastal sites it was apparently very large. Two midden heaps at Waitaki River Mouth are estimated to have contained the remains of 5,000 to 8,000 moas (Teviotdale 1939: 175; Anderson 1989a: 133). At Rakaia River Mouth, where in the nineteenth century great quantities were also reported, archaeological excavation of one square metre produced over 2 kg of moa bones (Trotter 1972a: 148). Excavations at Wakanui, 35 km to the south west, produced almost 70 kg of moa bones from 150 sq m (Canterbury Museum information). Although the quantities of moa bones in relation to bones of other species from the Rakaia River Mouth and Wakanui excavations may not be representative of the total sites, they suggest large scale specialised moa-hunting for food supply (see Table 1). The relative numbers of moa bones at Redcliffs Flat and Moa-bone Point Cave (lower deposits), by comparison, indicate a diversified economy in which moas, other birds, and marine mammals were all of considerable importance.

Moa remains on coastal sites include vertebrae, tracheal rings, crania, and phalanges, suggesting that moas were often captured close by and butchered at the base camps (e.g., Moa-bone Point Cave, Haast 1874a: 70; Tumbledown Bay, Allingham 1988; Waihao River Mouth, Orchiston 1974: 3.74-75). In sites where leg bones were most plentiful, it is possible that hunting parties returned with partly trimmed carcasses (Rakaia River Mouth, Haast 1871: 86-87; Kooyman 1985: 310). The paucity of evidence of moa-hunting ovens on Ka Pakihi Whakatekateka o Waitaha (the Canterbury Plains; see Figure 3) suggests that moa populations on the plains may have been hunted from river mouth sites by parties walking in as far as the foothills and using rafts to return (Anderson 1989a: 153). The numerous discontinuous patches of ovens and moa bone middens at Rakaia River Mouth and Waitaki River Mouth suggest frequently repeated temporary occupation (Anderson 1982: 56-60; see chapter 4.1).

Some moa bones have cutting marks made by sharp tools (Trotter 1972a: 137). A characteristic tool on moa-hunting sites south of Horomaka (Banks Peninsula), thought to have been used for moa butchery, is the silcrete flake blade (Anderson 1989a: 163-170; e.g., Rakaia River Mouth, Normanby, and Hamilton's shelter No. 1; Haast 1871: pl. vii: 3, 4; Griffiths 1942: figs. 31 and 32; Ambrose 1970: fig. 14a). Analysis of flake blades from Waitaki River Mouth (Vincent 1980a: 18-23) showed both the practice of secondary

retouching to steepen (strengthen) the edge angle, and also a high rate of longitudinal fracture, suggesting heavy use on tough material. Another tool likely to have been used in the processing of moa carcasses and skins is a type of subrectangular or oval knife with a finely bevelled edge, usually made from slate (in the archaeological literature known as ulu, an Inuit word meaning a meat knife or skin cleanser; Anderson 1989a: 158-159; Skinner 1974: 115 ff.; see chapter 2.9 for discussion of similar artefacts in greywacke known as teshoa). Slate knives have been reported from over 30 localities in Canterbury, particularly from the Waitaki Valley and the Mackenzie Country, and are less common further north where moa-hunting may have been generally less intensive (Orchiston 1974: 2.243, table 2.73; Anderson 1989a: 159, fig. 12.1; also one in nephrite from Arthur's Pass, Jacomb 1990).

Archaeological evidence clearly indicates that meat was cooked in earth ovens. Unwanted carcass sections were often dumped in disused oven hollows. Large concentrations of ovens have been recorded on coastal sites associated with moa remains. For example, at Rakaia River Mouth there may have been up to 1,000 ovens, usually up to 2.4 m across, arranged in groups of 5 to 8 (Trotter 1972a: 131; Anderson 1989a: 129). Nine ovens investigated recently ranged from 0.4 to 1.5 m across (McFadgen 1989). At Waitaki River Mouth there were an estimated 1,200 ovens, usually between 2 and 3 m across (Anderson 1989a: 132-133). At Redcliffs Flat the ovens were frequently even larger (up to 3.5 m across) and were used up to four times (Trotter 1975b: 193-199). At Wakanui the ovens were smaller (0.5 to 2 m across; Trotter 1977:359). Ovens associated with moa exploitation may have been scattered right along the south Canterbury coast (Tai O Arai Te Uru) from Taumutu to Waitaki (Anderson 1989a: 130). They have also been recorded near most north Canterbury river and stream mouths (e.g., the Waiau, Jed, Hurunui, Waipara, and Rakahuri).

It has been suggested that moa-hunting from coastal sites may not have been seasonal and that the meat was cooked for immediate consumption (Kooyman 1985: 318, 320). However, the frequent occurrence of moa egg shell (see Appendix 3) indicates exploitation in the nesting season. Most Canterbury river-mouth sites associated with moa-hunting have been thought to have been seasonally occupied because of the limited range of activities and artefacts represented (discussed in chapter 4.1). The large quantity of burnt and fragmented moa bone at Rakaia River Mouth and Waitaki River Mouth suggests the extraction of fat for meat preservation (Anderson 1982: 56). This interpretation is also suggested by two pits with fire-hardened walls at Wakanui, one 1.5 m across and 900 mm deep and the other much smaller, connected by a channel blocked with a wedge of baked clay, which have been interpreted as an apparatus for rendering fat from moa or marine mammal bones or blubber (Byatt 1972; Anderson 1989a: 130).

Moa-hunting sites inland include rock shelters, where evidence of pre-human moa nesting is common, for example the Tengawai Gorge and Waitaki Gorge sites (Hamilton 1897: 25; Ambrose 1970: 395, 404). There are also small oven sites associated with moa bones, for example at Waitaki I (ovens 1.0 - 1.3 m across; Mason 1963: 93), Waitangi Bridge (900 mm across; Trotter 1970a: 440), and Woolshed Flat, Aviemore (600 mm across; Trotter 1970a: 442). The small size of the ovens (less than 2 m across on most sites) implies smaller groups of people than the often larger ovens on coastal sites of the early

period. The presence of egg shell in human association suggests late spring or summer use (Anderson 1982: 63) by hunting parties penetrating from the coast. Small open camp sites (e.g., Avon Burn; McGovern-Wilson and Bristow 1991: 31) and larger base camps have been recognised (e.g., Killermont No. 2, Woolshed Flat, and Te Akatarewa; McGovern-Wilson and Bristow 1991: 32; Trotter 1970a: 442, 448). It has been shown that inland sites were situated where moa densities may have been relatively high (Anderson 1984: 730). However, there is no evidence of selective butchery prior to transport of carcass sections to the coast. Small quantities of leg bones and egg shell rather than head, neck, and foot bones are commonly found at inland sites (Ambrose 1970: 394, 404). No bones of moa species have been identified outside their habitat zone. No bones of the upland moa have been identified on coastal sites in Canterbury.

The period of moa-hunting indicated by radiocarbon dates from moa bone collagen (see Figure 2) clearly included the fourteenth and fifteenth centuries (river and stream mouth sites at Hurunui, Redcliffs Flat, Rakaia, Wakanui, Waihao, and Waitaki; and inland at Woolshed Flat). Two dates extending through the sixteenth and into the seventeenth century (Rakaia, NZ 932; Wakanui, NZ 1768) are from the same contexts as earlier dates, so that moa-hunting as late as this from these sites is unlikely. The latest moa bone collagen date is from Tumbledown Bay, layer 3 (NZA 338, late fifteenth century or later). Dates from shell and charcoal from the same layer (NZ 7654, NZ 7745, NZ 7656) overlap with it in the sixteenth and early seventeenth centuries. Other shell dates from moa-associated contexts are fourteenth to fifteenth century (Redcliffs, NZ 1111) and late fifteenth to mid-seventeenth century (Timpendean, NZ 3655). Inland dates from short-lived charcoal are fourteenth century (Killermont No. 2; Wk 2782, Wk 2916, Wk 2991), and those from unidentified charcoal extend into the fifteenth century (Boltons Gully, NZ 1378; Ahuriri, ANU 47; Junction Point, ANU 49; Gooseneck Bend, ANU 48). It is concluded that moa-hunting was widespread and relatively intensive in the fourteenth and fifteenth centuries, and may have continued on a smaller and more localised scale through the sixteenth century. No difference between the time scales of coastal and inland moa-hunting can be distinguished.

An early period in the Maori occupation of Canterbury can therefore be readily identified and its chronology defined by association with the moa. A distinctive range of artefacts is associated with this occupation (Jacomb 1995: 199-200). These are characteristic of the so-called Moa-hunter Period or Archaic Phase of material culture (discussed further in chapter 4.3). Industrial use was commonly made of moa bone, particularly for one-piece fish hooks and for reel-shaped necklace units (e.g., Trotter 1975b: fig. 4: 12; Skinner 1923: pl. xix: 6; Orchiston 1974: table 2.95).

The frequent occurrence of a range of moa species in middens of the fourteenth and fifteenth centuries, followed soon afterwards by their apparent extinction, suggests that human predation was a major cause of their disappearance (Anderson and McGlone 1992: 226-227). Initial over-exploitation from large specialised coastal sites may have been followed by more fragmented coastal settlement and localised predation, and by seasonal hunting in more distant valleys and basins, leading to the progressive elimination of moa populations catchment by catchment, a process termed serial overkill (Anderson 1989b). It is likely that the moa species of the shrublands, being closer to the coastal areas of preferred human

settlement and more vulnerable to extinction by hunting and habitat destruction, may have been extirpated first, and that the species of wetter forests and upland areas, being less accessible, may have been the last to disappear (Gill 1991: 35).

2.2 Birds other than moa

Bird bones (other than moa) have been recorded from over 60 archaeological sites in Canterbury. For some of these, species identifications are available (see Appendix 4, where common and scientific names are given). There are problems with many of the identifications. Some bird bones are difficult to identify (e.g., discussion in Dawson and Yaldwyn 1975: 214-215), and some species, although they have been named specifically in published lists, cannot be distinguished osteologically, particularly from isolated bones (e.g., brown kiwi and great spotted kiwi or roroa; kakariki or parakeet species; and pakaha or fluttering shearwater and Hutton's shearwater; Worthy 1994). Two species referred to in the literature are no longer accepted as valid taxa (extinct small kaka and extinct small weka; Holdaway and Worthy 1993: 106-107; Worthy 1994). No species identifications are available for some excavated assemblages (e.g., Pentland Downs, Hohoupounamu, Wakanui). Systematic identification or re-identification of existing collections is required.

Furthermore, the association of all the bird bone with pre-European Maori occupation is undocumented in some cases (e.g., some rock shelters: Gowan Hill, Paradise Cave, Shepherds Creek II) and is therefore questionable. An extensive species list from Murchison's No. 2 rock shelter (M33/6) is excluded from this synthesis because it is likely to have been accumulated by natural processes (particularly by ruru-whenua or laughing owls; Worthy 1994). The difficulty of establishing association with pre-European Maori occupation is compounded by the natural mixing of layer contents in shallow rock shelter deposits which has been demonstrated by bird bone analysis (Ambrose 1970: 395, 405-407). The problem is illustrated by the presence of both a moa bone radiocarbon dated to the pre-human period (NZ 918) and also a bone of the European introduced rock pigeon (Columba livia) in the collection from Timpendean (Worthy 1994). The dangers of perpetuating errors of identification and association in a synthesis such as this are recognised.

Taken as a general interim indication, the available identifications suggest a pattern of apparently non-selective, presumably opportunist, taking of many bird species for food, with larger scale, probably preferential, predation on a few key species. Marine bird species most commonly identified in coastal archaeological deposits are the koau tai or spotted shag (particularly abundant at Redcliffs Flat, Moa-bone Point Cave, and Tumbledown Bay), korora or blue penguin and crested penguin (also abundant at Redcliffs Flat), and pakaha or shearwater (for details of these and other species see Appendix 4). Common in both coastal and inland archaeological deposits are waterfowl species of estuaries, brackish lagoons, and inland waterways, notably ducks (particularly the parera or grey duck, and the putangitangi or paradise shelduck) and the widely distributed mapua or black shag. Forest bird species often present in both coastal and inland deposits are the kereru or New Zealand pigeon, tui, kaka, kiwi, and kakariki. Birds most common in inland deposits are the weka and koreke or New Zealand quail. Many of these harvesting preferences are documented ethnographically (Leach 1969: 88).

The presence of the bones of shearwater (Hutton's?), mottled petrel, prion, and white-capped mollymawk at inland rock shelter sites (weka Pass and Waitaki Gorge sites, Appendix 4) requires explanation. Hutton's shearwater, mottled petrel, and fairy prion would have been available inland in the breeding period, and provide an indication of the seasonal occupation of the shelters (Worthy 1994). However, the white-capped mollymawk is an exclusively marine species and was presumably transported inland as food, together with marine fish and shellfish, by the occupants of Timpendean (Trotter 1972b: 47).

Little archaeological evidence of change in bird exploitation over time exists but, where it does, a reduced range of birds was present in later compared with earlier deposits. At Moa-bone Point Cave, of the birds represented in lower deposits, the adzebill (previously known to archaeologists as the extinct giant rail), korora or blue penguin, and kaka were missing in upper deposits (Haast 1874a: 83-84). At Gooseneck Bend, shrubland species (the weka, fernbird, kahu or harrier, ruru-whenua or laughing owl, and pihoihoi or pipit) were present only in the lowest deposit, layer 3, leaving the koparapara or bellbird, the koreke or New Zealand quail, and waterfowl in layer 2, and only the putangitangi or paradise shelduck, and mapua or black shag in layer 1, providing slight evidence of a change to open grassland conditions (Ambrose 1970: 407-408, 434). At Panau, the New Zealand raven, which may have survived into historical times on Horomaka (Banks Peninsula), has been tentatively identified in a midden of the fourteenth to early fifteenth century (Wk 2569; Jacomb 1995: 97).

Canterbury avifauna has suffered progressive loss of indigenous species diversity since the beginning of human occupation. Species thought to have become extinct at an early stage, being particularly sensitive to predation and habitat disruption, include the South Island goose and the New Zealand swan, bones of which are found in small numbers in Canterbury archaeological sites (Appendix 4; Holdaway 1989: 11-17). More resilient, but like the moa extinct prior to European contact, were the adzebill, Finsch's duck, and the New Zealand eagle (Gill 1991: 51-66; Anderson and McGlone 1992: 228). Post-European-contact extinction of the koreke or New Zealand quail, ruru-whenua or laughing owl, South Island kokako, and piopio or South Island thrush was due to further habitat degradation and to predation by introduced rats and stoats (Gill 1991: 76-91; Turbott 1969: 426-429; Worthy 1994). The kakapo and mohopereru or banded rail are now also absent from Canterbury, and the kiwi, weka, kaka, kakariki, fernbird, and kakaruai or South Island robin have recently been reported only from the northern interior of the region (Bull *et al.* 1985). A third of the species recorded in Canterbury archaeological sites, and over two-thirds of the terrestrial species excluding waterfowl, are either extinct or no longer found in the relevant area.

Human predation may have been a factor in the extinction of the New Zealand swan, South Island goose, and adzebill (Holdaway 1989: 16-17), given their extreme vulnerability (ground-nesters, and the South Island goose and the adzebill flightless). However, bones of these and other extinct species occur too sparsely in Canterbury archaeological deposits to prove that predation was the direct cause of their demise. In general it is envisaged that habitat degradation through loss of forest cover, and predation by kiore and kuri (*Rattus exulans* and *Canis familiaris*), were major factors in reducing the species range. Most species which the archaeological record suggests were taken in large quantities were

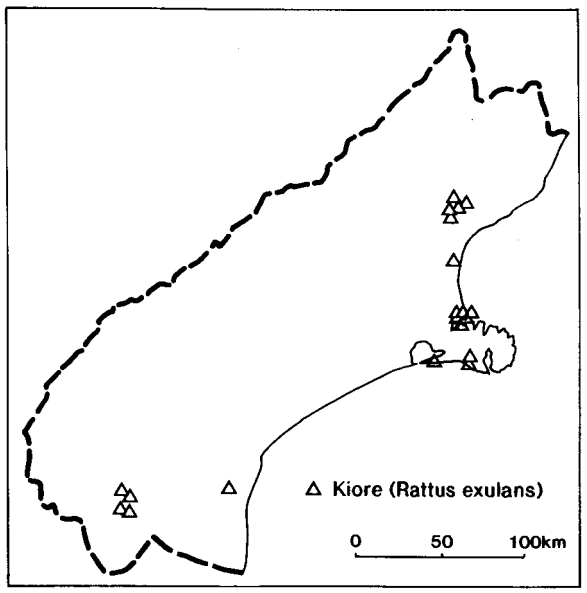

Figure 4 Distribution of identified More bones (*Rattus exulans*) in probably archaeological deposits (data in Appendix 5.1).

much more resilient. They are either still widely distributed (e.g., the koau tai or spotted shag, mapua or black shag, korora or blue penguin, parera or grey duck, and putangitangi or paradise shelduck; Bull *et al.* 1985), or they were still common during early European settlement (e.g., the weka, koreke or New Zealand quail, tui, and kereru or New Zealand pigeon; Turbott 1969: 426, 429).

Bird bone was frequently used for artefacts (e.g., toggles, points, and needles, Figure 24M, N). Barbed bone points usually interpreted as bird spears were often manufactured from bird bone (Figure 24E; Skinner 1924: 157; Trotter 1975b: figs. 9: 7; 13: 29, 34-35).

2.3 Terrestrial animals

Kiore bones (*Rattus exulans,* the Polynesian rat) have been recognised at 20 archaeological sites (Figure 4, Appendix 5.1) including 10 inland rock shelters and 6 caves on Horomaka (Banks Peninsula). This predominantly troglodyte distribution is probably caused by the pattern of archaeological recognition. Kiore bone numbers are usually small (e.g., 4 individuals in each of layers 2 and 3 at Gooseneck Bend; Ambrose 1970: 407), but 207 bones were excavated at Timpendean, more than any other species (Trotter 1972b: 47). In many contexts the kiore may have died naturally, but ethnographic records indicate that kiore were taken for food (Leach 1969: 88; Anderson 1988: 63; Beattie 1994: 352).

Kiore were dispersed accidentally or deliberately in association with human Pacific migration, and probably multiplied abundantly in New Zealand as nocturnal predators with high reproductive potential (Holdaway 1989: 15). Their presence in occupational deposits of probably early date in Waitaki Gorge rock shelters (Ambrose 1970: 390, 396, 407; ANU 47 and ANU 48) suggests rapid inland colonisation. Kiore are likely to have contributed to the pressure on populations of moa and other flightless and ground nesting birds, as probably did kuri (dogs). Subsequently displaced by European introduced rodent species, kiore are now found no closer to Canterbury than Te Anau (Bull 1969: 414).

Kuri bones (*Canis familiaris*, the Polynesian dog) have been found commonly in middens of all periods, particularly on coastal sites (20 of 25 reported occurrences; Figure 5, Appendix 5.2). Kuri meat was evidently a regular feature of Maori diet. A kuri skull in a garbage dump at Waihao River Mouth remained from pre-cooking butchery (Orchiston 1974: 3.75). Marks on bird bones, thought to be consistent with gnawing and chewing by kuri, might indicate a component of their domestic diet (Rakaia River Mouth and Takamatua; Trotter 1972a: 137; 1973a: 76; alternatively, chewing by kiore). The significance of kuri to the human community is demonstrated further by frequent drawings of kuri in rock

shelters (Figure 17 upper, Figure 18 upper; Bain 1985: 46; e.g., Ahuriri; Ambrose 1970: figs. 5d and 6a), by the Monck's Cave carved wooden kuri (Skinner 1924: pl. xxxii), and by the drilling of kuri teeth for suspension as ornaments (Figure 24P; also Moa-bone Point Cave, Haast 1874a: 83). The relative scarcity of kuri bones in inland sites may reflect the dominance of the hunting function of kuri over their food supply function in the context of inland excursions.

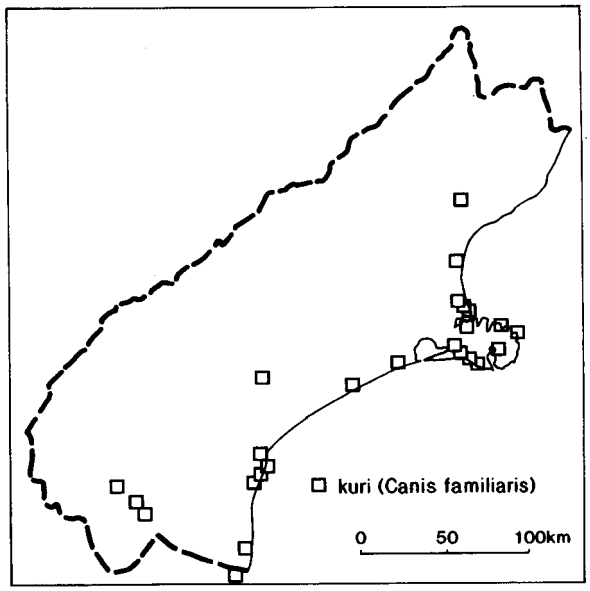

Figure 5 Distribution of identified kuri bones (*Canis familiaris*) in archaeological deposits (data in Appendix 5.2).

Pre-European kuri were slightly larger than the average European domestic dog, with heavy forequarters and massive neck and jaw development (Anderson 1981a: 16). The use of kuri skin for cloaks is commonly represented in ethnographic collections. Kuri hair found in Monck's Cave, pulled out by the roots, possibly in the preparation of skins, was brown, yellow, cream, and white (Skinner 1924: 159, 160). Kuri bone was utilised for tools (e.g. Flock Hill, Trotter 1987: 15; Tengawai, Hamilton 1897: 25).

Bones of the tuatara (*Sphenodon* sp.) have been recorded in middens at Tumbledown Bay (Te Kaio), Redcliffs Flat, and Paradise Cave (Mason and Wilkes 1963b: 99; Dawson and Yaldwyn 1975: 214; M36/32, site record form). The tuatara was once widespread throughout Canterbury, but is susceptible to rat predation and is no longer present on the mainland.

2.4 Marine mammals

Marine mammal bones have been reported from 38 Canterbury archaeological sites (Figure 6, identified species and scientific and Maori names listed in Appendix 6), all coastal apart from Timpendean rock shelter (New Zealand fur seal phalanges; Haast 1877: 52). In most cases the species are not identified, but they include kekeno or New Zealand fur seal (the most common), ihupuku or elephant seal, rapoka or leopard seal, whakahao or Hooker's sea lion, upokohue or Hector's dolphin, aihe or common dolphin, and unidentified whale. Haast identified porpoise bones at Moa-bone Point Cave (Haast 1874a: 83-84), but the only porpoise species recorded in New Zealand waters, the spectacled porpoise (*Phocoena dioptrica*), is exceptionally rare (one record from the Auckland Islands: Dawson 1985: 125-126). The terms porpoise and dolphin have often been used interchangeably. Haast's porpoise bones are likely to have been dolphin.

Kekeno or New Zealand fur seals appear to have been widely distributed on the Canterbury coast in the early period of Maori occupation (11 identifications listed in Appendix 6; most of the 17 other listed occurrences where seal bone was identified but not as a particular

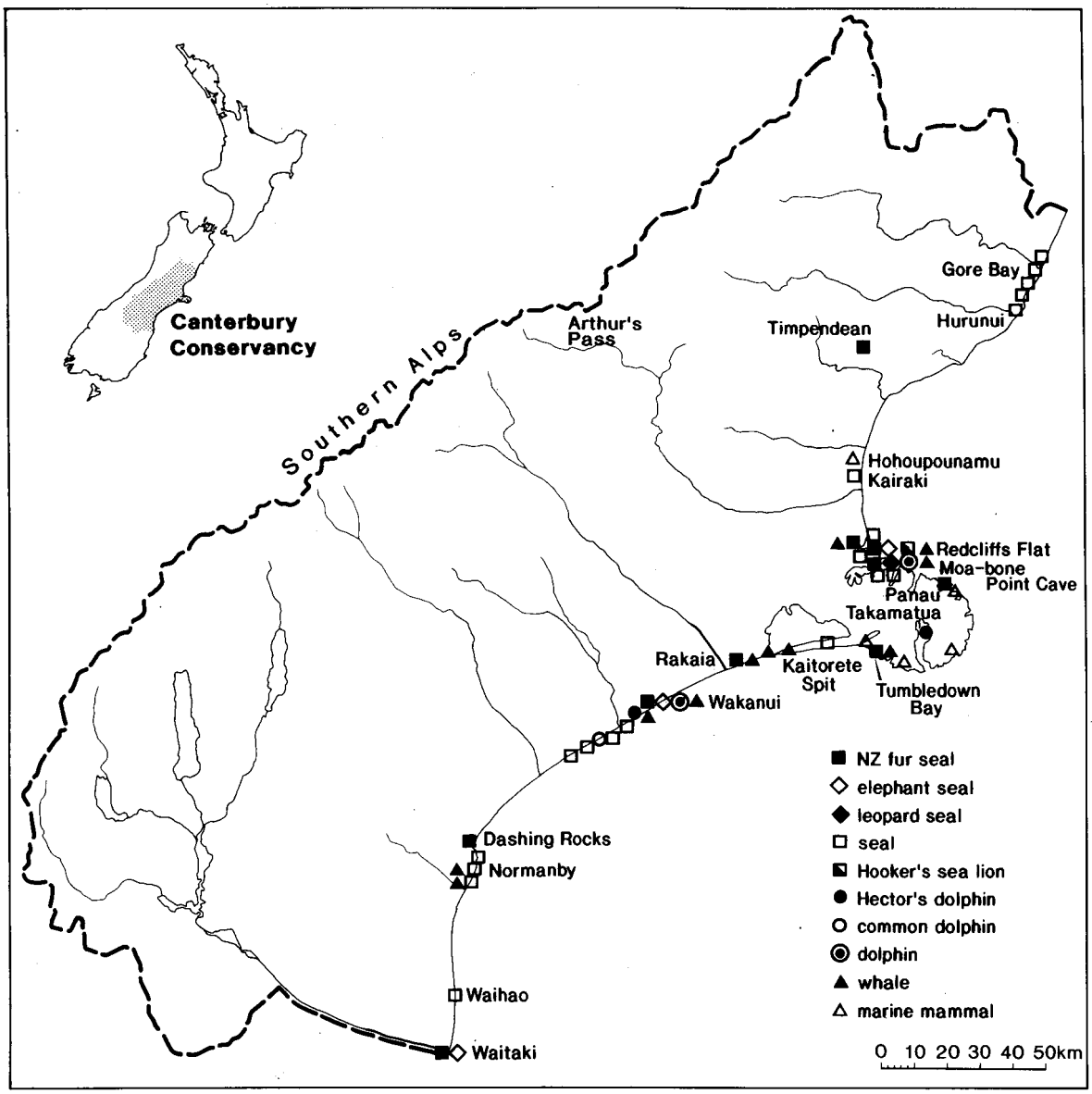

Figure 6 Distribution of identified marine mammal bones probably in human association (data in Appendix 6).

species were probably also kekeno). Local breeding populations were exploited on Horomaka (Banks Peninsula; bones of young kekeno at Tumbledown Bay; site record form). Kekeno bones were associated with moa bones at a range of sites dated to the fourteenth or fifteenth centuries (e.g., Redcliffs Flat, Rakaia River Mouth, Wakanui). Kekeno bones were more numerous than those of any other species at Redcliffs Flat in the school section and Hamilton's deposit (Trotter 1975b: 201; Dawson and Yaldwyn 1975: 214), and were an important component in the lower deposits at Moa-bone Point Cave (see Table 1). It appears that kekeno were commonly taken in the early period.

Whakahao or Hooker's sea lions were rare by comparison with kekeno (one positive identification listed in Appendix 6). They may have bred on Canterbury beaches in the early period of Maori occupation. Ihupuku or elephant seals, rapoka or leopard seals,

and whales (cetacean species not identified) were probably taken opportunistically when resting or stranded (Stonehouse 1969: 521-522). The use of whale bone for a variety of artefacts suggests that whales were a regular item in the diet. Whale bone was used particularly for amulets in the early period (e.g., Tumbledown Bay layer 3, Allingham 1988: fig. 4), and notably for patu in the late period (Skinner 1974: figs. 11: 15, 66, 86, 96). Imitation whale tooth ornaments in serpentine and moa bone are typical of the early period (e.g., Temuka, Duff 1956: pl. 15B; Redcliffs Flat and Moa-bone Point Cave, Trotter 1975b: figs. 4: 10, 11; 13: 1). Seal teeth were drilled for suspension as necklace units (Trotter 1975b: fig. 4: 6; Skinner 1923: pl. xviii: fig. 4).

Dolphins are seldom stranded, and may have been hunted with harpoons (Smith 1989: 100). Twenty-one harpoon points of both early and late forms have been listed from Canterbury, all but three from Horomaka (Banks Peninsula; Orchiston 1976b; note another from Hohoupounamu, Figure 24B; and 7 from Panau, Jacomb 1995: 69, and figs. 90-93).

A national survey of the archaeological evidence of marine mammal exploitation has concluded that, by the beginning of European occupation, the breeding range of kekeno had become confined to the south and west of the South Island as a direct result of human predation, and that the distribution of the whakahao had become restricted to the Stewart Island region (Smith 1989: 103-104). The kekeno, rapoka, whale, and probably dolphin bones identified in the upper deposits at Moa-bone Point Cave were in much reduced quantity compared with those in the lower deposits, but they indicate that the taking of stranded or hauled-out animals continued (Haast 1874a: 84). Marine mammal bones are less common in Canterbury middens thought to be of late date.

2.5 Fishing

Fish bone has been reported from over 50 coastal archaeological sites. Four-fifths of these sites are on Horomaka (Banks Peninsula; Figure 7) where fishing both over reefs and in sheltered open waters appears to have been relatively important. Analysed samples are few and small (identified species and scientific names listed in Appendix 7).

Maka or barracouta, a schooling pelagic species for which the wave shadow waters around Horomaka were particularly favourable (Anderson 1981b: 155), has been identified from six sites, notably at Tumbledown Bay where it was dominant (layer 3, 31 out of 42 identified individuals; Leach and Boocock 1993: app. 4). Maka and other unidentified fish species had been carried inland to Timpendean rock shelter (Trotter 1972b: 47). Hapuku has been recognised at six sites including Moa-bone Point Cave where four times as many bones were found in the upper deposits as in the lower (Haast 1874a: 83-84). Also noteworthy are rari or ling (at 4 sites), hoka or red cod (dominant at Panau, 21 out of 45 individuals; Leach *et al.* 1994), and tamure or snapper (2 individuals at Panau; Leach *et al.* 1994; not common so far south; Ayling and Cox 1982: 224-225; Jacomb 1995: 98). The eight species represented in the small Panau sample and the five species at Tumbledown Bay suggest a fairly generalised fishing strategy, including trolling with lures from canoes (maka and kahawai), use of baited hooks and lines from canoes (hoka, hapuku and tamure) and/or from the rocky shore (rari and paekirikiri or spotty), and inshore netting (repe or elephant fish).

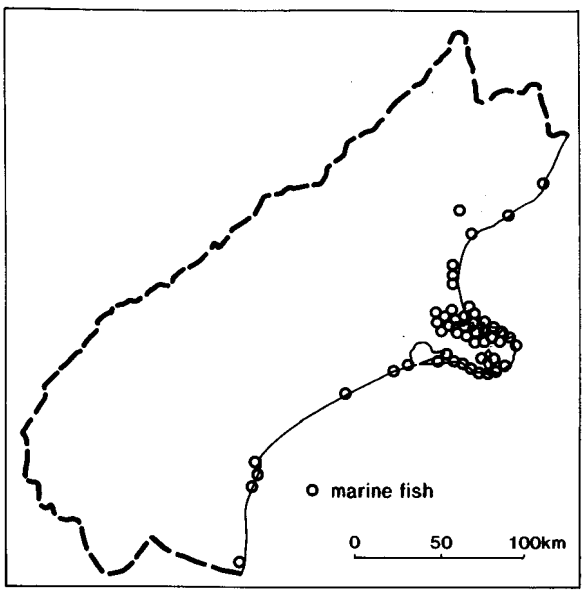

Figure 7 Distribution of identified bones of marine fish in archaeological deposits (data from site record forms).

Little quantitative evidence of the relative importance of fishing is available. From the Wakanui excavations, fish bones were 4% of the total bone assemblage by weight (see Table 1), and at Moa-bone Point Cave fish bones were 3% of the total number of bones in the lower deposits, suggesting that the numbers of fish represented were quite small. By comparison, in the upper deposits at Moa-bone Point Cave, 39% of the total number of bones were of fish. It appears from the scanty evidence of investigated bone deposits that fish might have played a supplementary rather than a dominant role in the diet in the early period, but that in some areas its importance might have increased in the later period.

In contrast with the deficient bone evidence, fishing-related artefacts are numerous in Canterbury. There are very extensive fish hook collections, particularly from sites in the Horomaka and Timaru areas. Barracouta lure hook points are common (trolling gear; Hjarno 1967: 15-18; Anderson 1981b). Plain curved points (Hjarno type Al) are represented in most assemblages and may have been a long-lived form (e.g., Takamatua, a fourteenth or early fifteenth century site, NZ 1539, Trotter 1973a: fig. 3; Normanby, Griffiths 1941: fig. 34; 1942: fig. 45; Pa Bay, associated with artefacts of European origin, Brailsford 1981: fig. 159:4). Also prominent are the notched form (Hjarno type A2; e.g., Tumbledown Bay, Allingham 1988: fig. 5g,s), and the apparently late dog-leg type (Hjarno type A3; e.g., Normanby, Griffiths 1941: figs. 36-39; also Figure 24G, dog jaw bone, upper occupation layer, Hohoupounamu). Barracouta lure shanks, usually of wood, are known from Moa-bone Point Cave (Trotter 1975b: fig. 13: 36, 37). The minnow-shaped lure hook (Hjarno 1967: 18-22) is less common in Canterbury (20 shanks and 10 points listed in Orchiston 1974: tables 2.110 to 2.129; also Figure 24H and J, two minnow-shaped lure shanks in moa bone from Hohoupounamu).

One-piece bait hooks, for line fishing over reefs or sandy sea beds, are frequently found (e.g., in moa bone manufactured at Redcliffs Flat; Trotter 1975b: fig. 9: 1-4, 8, 9, 12). Shank-barbed one-piece hooks (Hjarno type 134f), generally thought to be a late form characteristic of the eastern North Island (discussed in Leach, B.F. 1978: 13-14; Leach, H.M. 1978: 106; but see chapter 4.3), are recorded from Panau, Tumbledown Bay, Paua Bay, and Fishermans Bay (eastern Banks Peninsula), and Rakaia (Jacomb 1995: 65, 134; Allingham 1988: fig. 5o; Trotter 1956: 251, fig. 8).

There is a great variety and profusion of two-piece bait hook points from Canterbury (e.g., one from Hohoupounamu, Figure 2417; Hjarno type C4). A distinctive sub-variety of two-piece bait hook point has been identified as characteristic of Canterbury (Jacomb

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Figure 8 **Fish hooks: two-piece bait hook points; left, Panau, Jacomb type C3ci; right, Moa-bone Point Cave, Jacomb type C3cii (photograph by Chris Jacomb, Canterbury Museum, descriptions in Appendix 13.1).**

1995: 131-132; Jacomb type C3c; Figure 8). The type has a rounded cross section, a substantial internal barb, and well developed lashing grooves and lashing surface, and is usually in moa bone. The variety is well represented at Tumbledown Bay, Panau, Moa-bone Point Cave, and Monck's Cave, and appears to have come into use in an intermediate period, earlier than some characteristically late fish hook types (cf. Allingham 1988: fig. 5k-1; Trotter 1975b: fig. 13: 14-18; Skinner 1924: pl. xxviii; see chapter 4.3).

Fishing nets, sinkers, floats, and canoe fragments have been recovered from coastal caves (Moa-bone Point Cave and Monck's Cave; Haast 1874a: 61, 83-85; Skinner 1924: 154-156). Stone sinkers, mainly of simple grooved egg-shaped form, have been found on all parts of the Canterbury coast (e.g., Redcliffs Flat; Trotter 1975b: fig. 9: 20-21).

The archaeological data on freshwater fishing is very sparse, although the ethnographic literature on the taking of tuna or eels is extensive (Leach 1969: 38-39, 84; Anderson 1988: 5, 30, 37, 67, fig. 29). Bones of tuna, and possibly kokopu or native trout (?Galaxias sp.), were found at Gooseneck Bend rock shelter (Ambrose 1970: 407). Two possible eel traps have been recorded at Ikawai near the Waitaki River (Vincent 1980b: 36), and

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