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The Nelson–Marlborough region: An archaeological synthesis

Aidan J. Challis
Department of Conservation, Wellington

ABSTRACT

Pre-European archaeological evidence from the Nelson–Marlborough region is discussed. Site recording is far from comprehensive and detailed investigations have been few. Distributions of archaeological features indicate that activity was predominantly coastal, constrained by a rugged, cool interior. Occupation was well established by the thirteenth century A.D. Intensive exploitation of metasomatised argillite was in progress by then and extended at least into the fifteenth century. Defended *pā* appear later than this. Horticulture may have been practised throughout the period. Discontinuities in settlement and economy were caused by European intrusions and the Ngati Toa invasions in the early nineteenth century.

Key words: NELSON, MARLBOROUGH, NEW ZEALAND MAORI, SITE DISTRIBUTIONS, HORTICULTURE, PITS, TERRACES, *PĀ*, STONE WORKING, ADZES, FISH HOOKS, RADIOCARBON.

INTRODUCTION

Pre-European archaeological evidence is the focus of this review. The site record file and the publications of the New Zealand Archaeological Association provide the main sources of data. Metric site numbers are quoted. The Maori oral history of places and activity has not been investigated. Radiocarbon dates are listed in Appendix 1. The dates are discussed as calibrated ages with a 95% confidence interval (Stuiver and Reimer 1986; terminology following McFadgen 1982). Overall the state of knowledge is preliminary and patchy. Discussion of European archaeological sites, research needs and strategy for site protection and management is being published separately (Challis 1991b), and a more lengthy account also exists (Challis 1991a).

The Nelson–Marlborough region is an immense area by South Pacific comparison (*c.* 30,000 km^2). It is enormously variable, presenting highly distinctive coastal environments backed by a diversity of mountainous country (McEwan 1987). Strong cultural associations both to the north across Cook Strait and to the south were evident at the time of early European contact (Simmons 1987b).

HORTICULTURE

The environmental issue central to pre-European horticulture is climatic suitability for kumara cultivation. Law (1969: fig. 5) regarded the coastal zone of Nelson and Marlborough as within the limit of kumara tolerance, which he defined as a maximum 160 day screen frost season and a minimum annual 1900 mean hours of bright sunshine. Similarly Groube (1970: fig. 15) mapped the coastal perimeter from Farewell Spit to Cape Campbell as an

acceptable "second priority climate" for kumara cultivation, based on the number of days of ground and screen frosts. Such generalised approaches are helpful in identifying a major factor favouring the coastal zone for settlement.

Within the coastal zone are wide variations in climate: for example, high wind exposure on the Kaikoura coast and in the Marlborough Sounds, sunny and sheltered but prone to frost in Tasman Bay, and summer heat and drought in coastal Wairau. Frost figures issued by the New Zealand Meteorological Service (1983) place Blenheim, Nelson, Riwaka and Rai Valley amongst Groube's "difficult climate" group for kumara (ground frosts over 80 annually, screen frosts over 30 annually), whereas figures for Brightlands Bay, Farewell Spit, Cape Campbell and Moutere Hills are comparable with his best "kumara littoral" group (ground frosts under 15 annually, screen frosts under 2 annually). Whereas some sloping maritime situations might be favourable for kumara, the frostiness of sheltered coastal lowlands and valleys might render them marginal at best.

Some archaeological evidence seems to contradict this expectation. The largest areas (400 ha) claimed to carry Maori plaggen soils (soils containing sand or gravel transported and deposited by the Maori for horticultural purposes: McFadgen 1980) lie on sheltered lowlands in Tasman Bay (Rigg and Bruce 1923; Chittenden *et al.* 1966: 16; Challis 1978: 28ff.). A radiocarbon minimum age (McFadgen 1982: 387) for a Waimea borrow pit of the fifteenth to the seventeenth century (WK 1776, N27/122; B.G. McFadgen pers. comm.) discounts alternative interpretative possibilities, either that the soils are of natural origin, or that they relate to the cultivation of the European potato. Substantial pre-European lowland horticultural systems are indicated.

Use of twentieth century weather station records to assess suitability for pre-European kumara cultivation may have limitations. In principle there is the problem of the applicability of generalised climatic data based on a limited number of recording stations to a situation in which local climatic factors would have been paramount. Specifically, modern weather stations are located in open sites, whereas pre-European horticulture probably took place in forest clearings. Forest clearings provide frost protection compared with open land, outgoing radiation reducing and night temperature increasing with reducing clearing size (Geiger 1973: 351–52), so that the frost prone season might be reduced by perhaps 20 days or even eliminated altogether. Some of the evidence of horticulture is located on slightly elevated or sloping sites not so much affected by cold air drainage. The impact of climatic change in the region is not established, and extrapolation has not been attempted (Burrows 1982: 157).

Evidence of horticulture, which by investigation or by comparison outside the region appears to be pre-European, is in the form of Maori plaggen soils and stone or earthen rows, lines, walls, piles and mounds. Maori plaggen soils and associated borrow pits have been recorded in 38 coastal situations distributed throughout the region. Stone rows and similar features have been recorded at 42 sites, 11 of these with mounds, on D'Urville Island, in the Marlborough Sounds and on the Kaikoura coast but not elsewhere in the Nelson region (Fig. 1; Challis 1991a: schedule 1).

Investigations at Clarence (P30/5 and P30/6) formed part of McFadgen's study of Maori plaggen soils (1980: 9–13). The soil at P30/6 covered an area of 4.5 ha and is calculated to have received a deposit of about 5,530 m^3 of grit from adjacent borrow pits. Minimum radiocarbon ages for this substantial operation, and for the Maori plaggen soil at P30/5, are in the range fifteenth to mid-seventeenth century (NZ 3397 and NZ 3113).

On D'Urville Island at Moawhitu Beach, Greville Harbour (P25/100), Wellman (1962: 58–60, 70) claimed the addition of gravel to soils in the older of his two stratigraphic

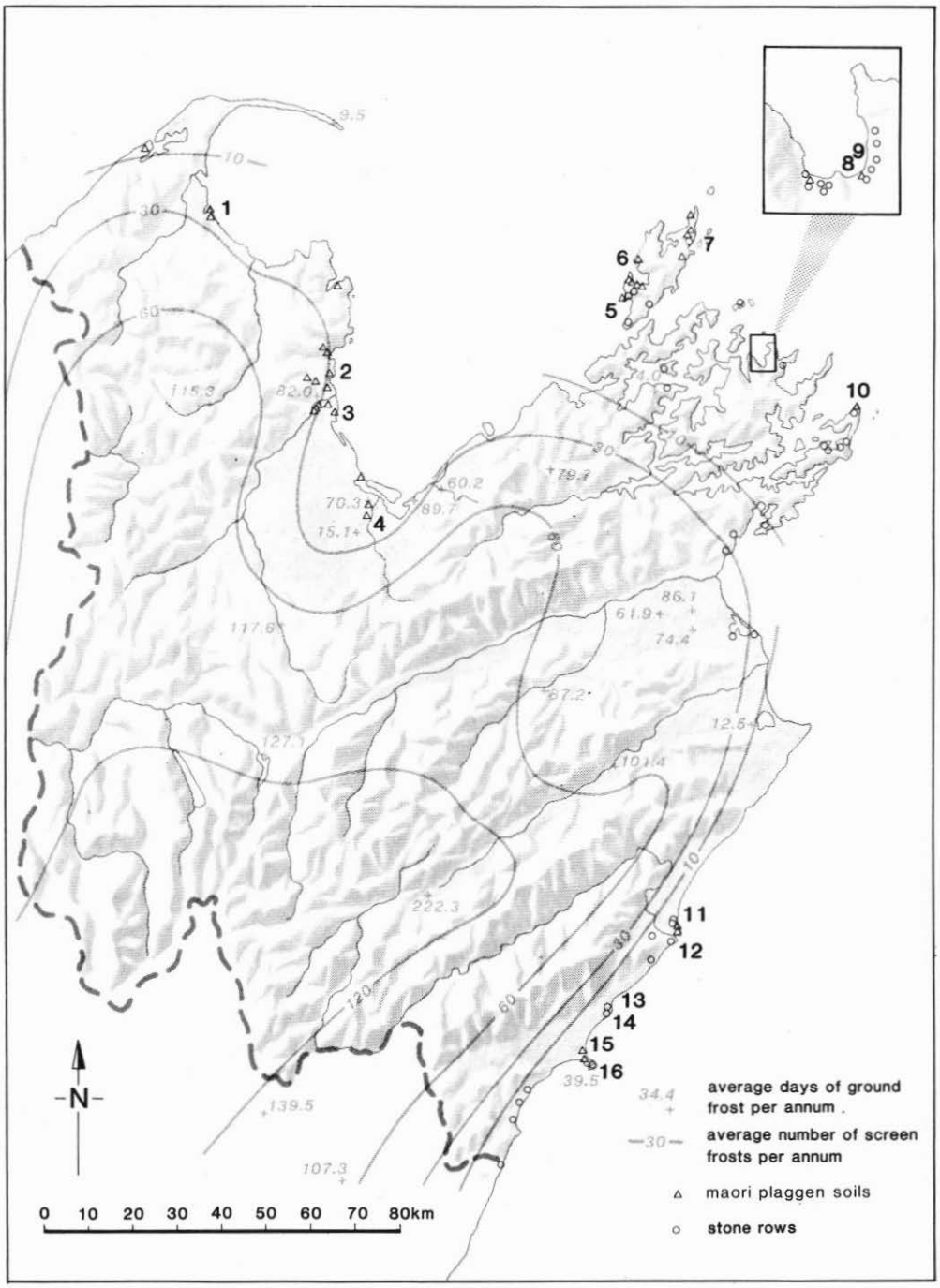

Figure 1: Distribution of evidence of horticulture (source of climatic data: New Zealand Meteorological Service 1983). 1. Parapara; 2. Stephens Bay; 3. Motueka; 4. Waimea; 5. Manawapukapuka; 6. Moawhitu Beach, Greville Harbour; 7. Waitai *pā*; 8. Cattleyard Flat; 9. Waitui *pā*; 10. Oamaru Bay; 11. Clarence P30/5 and P30/6; 12. Clarence P30/4; 13. Mangamaunu; 14. Parikarangaranga; 15. Takahanga; 16. Avoca.

contexts, for which radiocarbon ages give a range from the thirteenth to the early sixteenth centuries (NZ 481 and NZ 482, statistically compatible charcoal and marine shell ages). He argued that kumara cultivation was important in the early settlement of D'Urville Island. (For other horticultural evidence on D'Urville Island see Prickett and Walls 1973: 12–13.) The stratigraphic position of Maori plaggen soils (clay soils with fine beach gravel added) at Parapara Spit in Golden Bay (M25/10, 12; McFadgen and Challis 1979: 143–44) is correlated with those seen on D'Urville Island by Wellman (McFadgen 1985: 46). Radiocarbon minimum ages are in the range fifteenth to sixteenth century (NZ 4505, NZ 4606).

A maximum radiocarbon age in the eleventh to the thirteenth century for a gravel-added Maori plaggen soil adjacent to borrow pits at Motueka (NZ 3307; N26/80) has an unknown, possibly large, inbuilt age (McFadgen 1982: 387). However, research in the vicinity indicated that the addition of gravel achieved improvements in soil friability, drainage and temperature regime (Challis 1976a). Whether large areas of dark sandy loam soils in the Motueka and Riwaka areas were affected by addition of sand mulch (as opposed to gravel) and burning of brushwood by the Maori (Rigg and Chittenden n.d.; Rigg 1926; 22 site records not marked on Fig. 1) remains in doubt. However, addition of sand has been claimed at Stephens Bay (N26/96) where a coarsely granular sandy clay loam appears to have been modified to a light fine sandy loam (Challis 1978: 31).

The consistently pre-European radiocarbon ages of the Maori plaggen soils investigated rule out suggestions that the method of adding gravel was recent. Indeed it may have been practised from an early stage. One example might be chronologically late because of its apparent association with a defended *pā* at Waitai on D'Urville Island (P25/198) where the lowest terrace (20.5 x 4 m) had pebbles added to the soil (N. and K. Prickett site record).

A relationship between Maori plaggen soils and stone rows is suggested in some cases. At Manawakupakupa on D'Urville Island (P26/56), black soil with water-rolled pebbles is present within walled garden areas (N. and K. Prickett site record). In the Marlborough Sounds at Cattleyard Flat, Titirangi (P26/217), the soil in garden plots was thought to have been modified by the addition of pebbles (Trotter 1977: 13). The origin of the pebbles in these and other D'Urville Island and Marlborough Sounds situations may merit closer study.

The ages of stone row systems may also span a long period. A radiocarbon age of the thirteenth to fourteenth century (NZ 1836) has been derived from a site south of the Clarence River where an isolated stone row has been reported (P30/4; Trotter and McCulloch 1979: 5). At Avoca, Kaikoura, a linear stone feature with placed stones and a right-angled bend, thought to be a garden wall (McCulloch 1982: 2), relates to the fourteenth to sixteenth centuries (NZ 6496, NZ 6525 and NZ 6566). Radiocarbon ages of stone-covered mounds at Cattleyard Flat focus in the sixteenth to early seventeenth centuries (NZ 4498, NZ 4499; Trotter 1977: 12–13). The field evidence of stone rows north of the Clarence River is reminiscent of Palliser Bay (compare Trotter and McCulloch 1979: fig. 9, with Leach 1979: figs. 6, 8, 9, 14), where prehistoric gardens are thought to have produced kumara and possibly also gourds from the twelfth to the fifteenth centuries; but investigation of the Clarence stone rows (P30/5; Trotter and McCulloch 1979: 12) produced two radiocarbon ages with ranges from the seventeenth century to the European period (NZ 4500 and NZ 4501: the stratigraphic relationship of these samples to the earlier Maori plaggen soil already noted, NZ 3113, is not known). At three sites in Marlborough, rows and mounds appear to relate to defensive *pā* of class 3 (Waitui, P26/218; Mangamaunu, P31/17; and Parikarangaranga, P31/18; Trotter 1977: 16; Brailsford 1981: 113), thought to be chronologically late. (Classification of *pā* is discussed below.)

Pre-European horticulture therefore appears to have been well established in various coastal areas at different times. Population size and other social factors may have been more significant than macro climate in governing horticultural practice in the coastal zone (cf. Hart 1990). The availability of European crops caused a reorientation of the Maori economy. There were potato cultivations in the Marlborough Sounds in 1820 (Simmons 1987a: 46; Trotter 1987: 112) and on D'Urville Island in 1840 (P25/223, Prickett and Prickett 1975: 125). Extensive cultivations of various crops were observed at Riwaka, on the granite coast of western Tasman Bay and in Golden Bay in the early 1840s (reviewed by Orchiston 1974: 3.7). Some field evidence may relate to this period.

PITS

Law (1969: 227–35) defined the extent and variety of pits in coastal Nelson and Marlborough. Fox (1974) drew on numerous examples in various parts of New Zealand in confirming the kumara storage function, whereas South Island field workers have interpreted some pits as houses. The term pit applies to holes in the ground of a variety of shapes and sizes. It may be helpful to distinguish between: (1) shallow pits generally 300 mm or less in depth, frequently with flat bottoms and sharp sides, some with one open side, with or without raised rims; (2) rectangular pits approximating to Fox's playing card shape, with or without raised rims, with the long side 3 m or more and an original depth of 1 m or more; (3) small pits generally 2 m across or less; (4) irregular pits on low fluvial terraces which may prove to have been borrow pits related to Maori plaggen soils (e.g., P28/39, Seventeen Valley, Wairau, Brailsford 1981: 74); and (5) circular pits sometimes in isolated situations, usually with raised rims or lips, which may have been earth ovens (referred to as *umu tī* in the southern South Island: Fankhauser 1987).

A number of shallow pits on the Marlborough coast have been excavated. At Peketa south of Kaikoura two of a series on a sloping site (O31/52, No. 2) were 4 m long and "proved to be dwellings with 2–3 cm diameter stakes forming the walls and artefact material associated with daily life at the occupation level" (Brailsford 1981: 132). On terrace 3 (O31/15–16) were two adjacent "dished floor" areas 300 mm deep, apparently circular or oval, with occupational debris including nephrite adzes and chisels and a serrated fishhook point (ibid.: 131, figs. 117–120; radiocarbon ages NZ 4152, NZ 4153, NZ 4154, and NZ 4296, the marine shell age ranges overlapping in the late sixteenth and seventeenth centuries, and the dog bone ages dubious). On terrace 6 (O31/32) was "evidence of a flimsy dwelling" (ibid.: 132, fig. 122; radiocarbon age NZ 4502, relating to the fortification, seventeenth century or later). Excavation of two pits (4.6 x 3.0 x 0.7 and 7.6 x 4.6 x 0.6 m) at Seddon's Ridge 1 km north of Peketa (O31/40; Trotter 1972) located no postholes or drains but found charcoal and heat fractured stones on floors. At Clarence a saucer-shaped pit at Ridge End Pa (P30/1; Trotter and McCulloch 1979: 14) seemed to have had a roof and was said to be a dwelling. Further north at Titirangi (P26/246) one pit 4.5 x 1.5 m and 350 mm deep had a shallow central hearth (Trotter 1977: 16). On the basis of this evidence of habitation, shallow pits or hollows with or without raised rims may be interpreted as houses. There are rectilinear examples in the Nelson region (e.g., N26/60, Fisherman Island, Astrolabe Roadstead, Challis 1978: fig. 20). Near Wainui Inlet in Golden Bay a pit 2.5 m in diameter with a raised rim on the lower side has been recorded where a Native Reserve Plan shows huts (N25/49, Uarau Kainga; Wilkes 1960: 29–30).

Deeper rectangular pits are common (Fig. 2). In Golden Bay, most are rectangular or oval, 4 x 3 to 3 x 2 m, a minority have raised rims, a few are circular, drains are rare, and depth approaches 1 m in many cases (e.g., Puramahoi, Pariwhakaoho A, M25/36; Brailsford 1981: 86). Around Tasman Bay, rectangular pits 6 x 4 to 3 x 2 m predominate (Challis 1978: 34). The few with raised rims are at the smaller end of the range. On D'Urville Island, pits are the most frequently occurring archaeological feature (over 125 sites; Prickett and Prickett 1975: 114, 127), characteristically 3 x 2 m in groups on spurs. Smaller pits 0.75 to 1.5 m square are often isolated (noted below). In the Marlborough Sounds, pits are generally rectangular or oval, size and depth vary widely, raised rims are common and double pits occur (Rutland 1894, 1897; Brailsford 1981: 16–55; Law 1969: 229–31; Trotter 1974a). Pits from Clarence to Claverley (about 40 sites: Brailsford 1981: 100-48) are commonly rectangular, 6 x 4 but up to 11 m across and up to 1 m deep with raised rims. A few pit sites exist up to 10 km from the coast, notably in the Holyoake Valley, Motueka (N25/2, 3, 72, 73, 93; Challis 1978: fig. 19), and in eastern Marlborough near Tuamarina (P28/1–3 and 52; Brailsford 1981: 75) and in the Dashwood Pass (P28/37–38; N. Matthews and B. Brailsford site records).

Few large rectangular pits have been excavated. At Pari Whakatau (Duff 1961; O32/20), pit C, a massive 11 x 7.5 m and 1 m deep, had four internal rows of 7 posts each and 12 massive regularly spaced posts around the walls. Pit P, 5.8 x 4.9 m and 1 m deep, had a more confused pattern of posts. Its apparent porch might be discounted as two phases of construction and use. Pit B was also a two stage structure. A radiocarbon age of a major post of pit C was fifteenth to seventeenth century (NZ 133; unknown inbuilt age). Although the pits were interpreted by the excavators as houses, there were no trodden floors, no hearths, and no unequivocal entrance structures such as would be appropriate to dwellings. There are terraces at Pari Whakatau suitable for above-ground houses (Brailsford 1981: 148). The pits are likely to have been for storage (Fox 1974: 149). A pit 4 m long at Peketa (O31/52, No. 4) had no artefacts or postholes and was thought to be a possible kumara store (Brailsford 1981: 132). A pit at South End, Clarence, was found to have the remains of large upright posts but no occupation floor (P30/9; pit Y; Brailsford 1981: 101; Trotter and McCulloch 1979: 13). Food storage was thought the likely function. At Sawpit Point, Awaroa Inlet (N25/18), a pit 6 x 5 m had rows of post hole cavities along the sides and towards the centre. It was also thought to be a storage facility for root crops, used soon after as a rubbish dump (Barber 1989: 2).

Pits 2 m across or less, now generally 200 to 500 mm deep, have been recorded on 56 sites on D'Urville Island, 12 in the Marlborough Sounds, and 4 on hills around Wairau. On D'Urville Island the small pits are frequently isolated, but also occur with terraces and larger pits. None has been excavated.

Only once in the region have oven stones been reported in circular pits (Boulder Bank, Nelson, O27/11). It is suspected that some inland pits might have been earth ovens (e.g., east of Takaka, N25/28, 29, 31; Graham Valley, N27/138; Dashwood Pass, P28/33).

There is therefore no single answer to the question of the function of pits in the Nelson–Marlborough region. Rectangular pits with or without raised rims with a depth of over 1 m may have been for storage. The distribution suggests substantial food production systems in various coastal areas, partly correlating with recorded evidence of horticulture (compare Figs 1 and 2). Shallow pits (generally 300 mm deep or less) of various shapes where investigated appear to have been dwellings. Features too small for dwellings may also have been for storage. Where dated, the evidence appears to relate to the later part of prehistory, although in the 1890s Rutland noted trees thought to be four centuries old

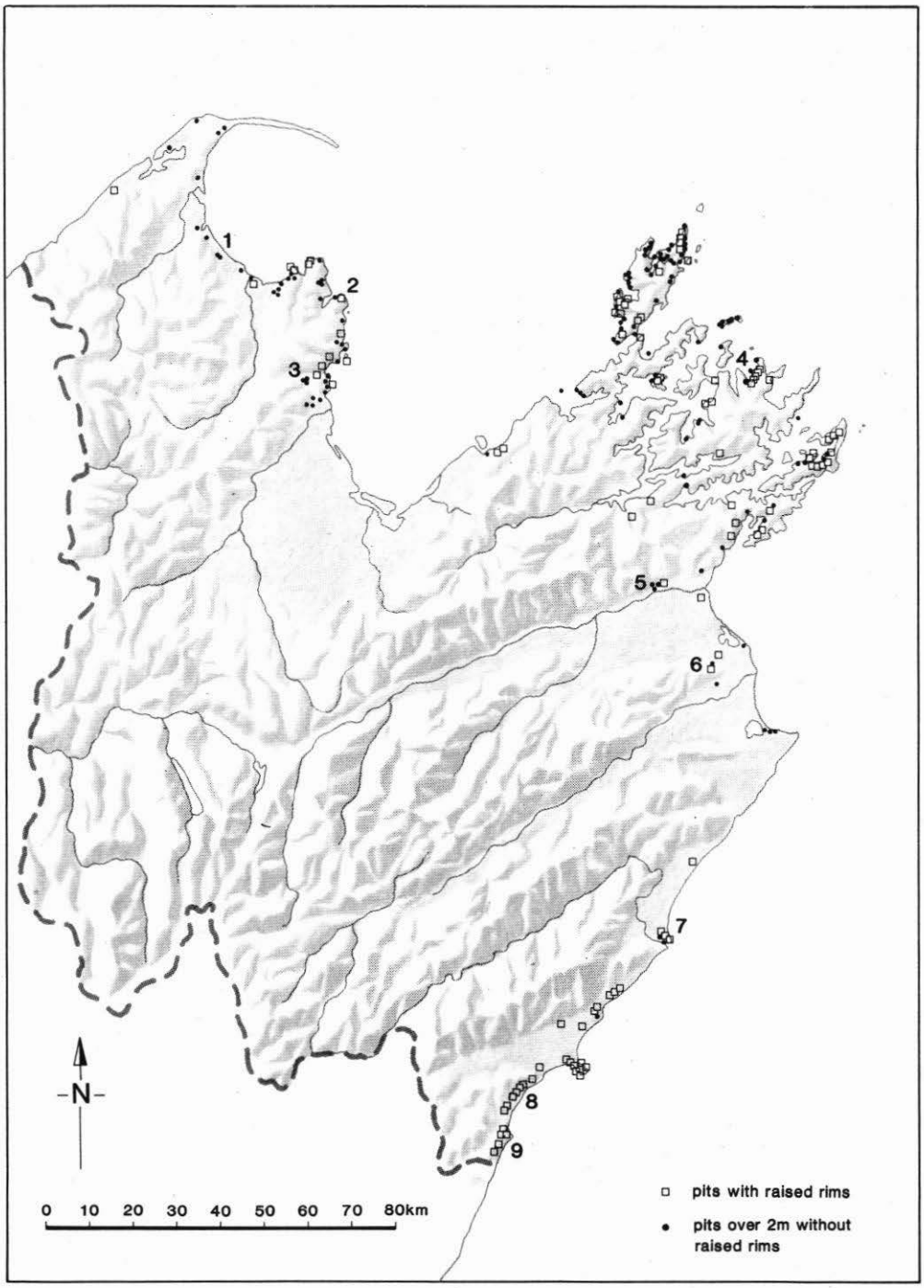

Figure 2: Distribution of pits over 2 m across without raised rims, and all pits with raised rims (site records without descriptions excluded). 1. Pariwhakaoho, Puramahoi; 2. Awaroa Inlet; 3. Holyoake Valley; 4. Titirangi; 5. Tuamarina; 6. Dashwood Pass; 7. Clarence; 8. Peketa; 9. Pariwhakatau.

growing in and around large pits in the Marlborough Sounds (1894: 221–22, 232). No early European accounts of the region describe storage pits. Several sketches show raised storage platforms (Astrolabe, 1827, de Sainson in Prickett 1982: fig. 1; Pukerua, Pelorus Sound, 1844, and Taupo Pa, Golden Bay, N25/50, 1843, Barnicoat in Brailsford 1981: 51, 81).

TERRACES AND HOUSES

Of the 230 recorded sites with terraces in the region (Fig. 3) most are associated with other archaeological features, primarily pits, midden and *pā* defences. Comparison of Figure 3 with the distribution of defended *pā* (Fig. 4) indicates that apparently undefended terrace sites have been recorded particularly on D'Urville Island, in Golden Bay, in western Tasman Bay and in the Marlborough Sounds. It can be difficult to distinguish isolated terraces from natural features on the basis of surface evidence, particularly in soft lithology. For example, a series of 16 small terrace sites (terraces 3 x 2 to 9 x 2 m) has been recorded in the Otuwhero Valley west of Marahau (Foster 1990; N26/193–208). These may have been temporary foraging camps, but such features merit investigation to establish their origin.

Terraces are abundant on D'Urville Island (about 90 recorded sites) and in the Marlborough Sounds (about 60 sites). They commonly range between 11 x 4 and 6 x 3 m in size. Smaller terraces 3 x 2 m are frequent, but larger terraces 20 to 35 m long are rare. It has been assumed on the basis of early European illustrations that those in the average to smaller size range were for built structures. Accounts from the Cook expeditions of *pā* in Queen Charlotte Sound (Q27/3, Q26/9; Brailsford 1981: 19–32) show them to contain many buildings, all apparently above ground and set on terraces. Many other defended *pā* interiors appear similarly full of terraces (e.g., Pakawau M25/9, ibid.: 89; Moutere Bluffs, N27/74, Challis 1978: fig. 11). Terraces excavated in Marlborough have produced evidence of dwellings. A terrace at Titirangi (P26/214; Trotter 1977: 12) bore the "remains of a flimsy wooden shelter". Shallow pits, rectilinear and curvilinear, thought to have been dwellings, have been discussed in the previous section. A terrace at South End, Clarence (P30/9 terrace x; Brailsford 1981: 101), had "evidence of occupation and the possibility of a house structure". The association of terraces with settlement sites and dwellings in the Nelson–Marlborough region is therefore strong, but associated house structures have only been defined in the briefest terms.

Examples of houses on level surfaces are also present. Post hole patterns at Wairau Bar (P28/21) suggest a structure 5 m square and two smaller rectilinear forms (Anderson 1989: 124). At Matariki, Clarence (P30/2), dwellings with the remains of wooden posts and at least one square stone fireplace were found on flat ground between pits (Trotter 1966: 124; Trotter and McCulloch 1979: 6). A more substantial house was excavated at Takahanga, Kaikoura (O31/63; McCulloch and Trotter 1984: 404, fig. 6). It had an internal area of 4.75 x 2.75 m with a doorway to an open porch 1.75 m deep at the northern end. A central post suggested ridge pole construction. The house appeared to have been rebuilt at least twice. Fragments of nineteenth century bottle glass were incorporated in a stone fireplace towards the south end.

The porched rectangular form of the Takahanga house accords with early European records of the larger type of Maori *whare*, discussed by Prickett (1982), and seen at Queen Charlotte Sound in 1777, at Little Waikawa Bay in 1820 and at Riwaka in 1841. (For Little Waikawa Bay see also Trotter 1987: 118-19.) Most Maori structures seen at the time of early

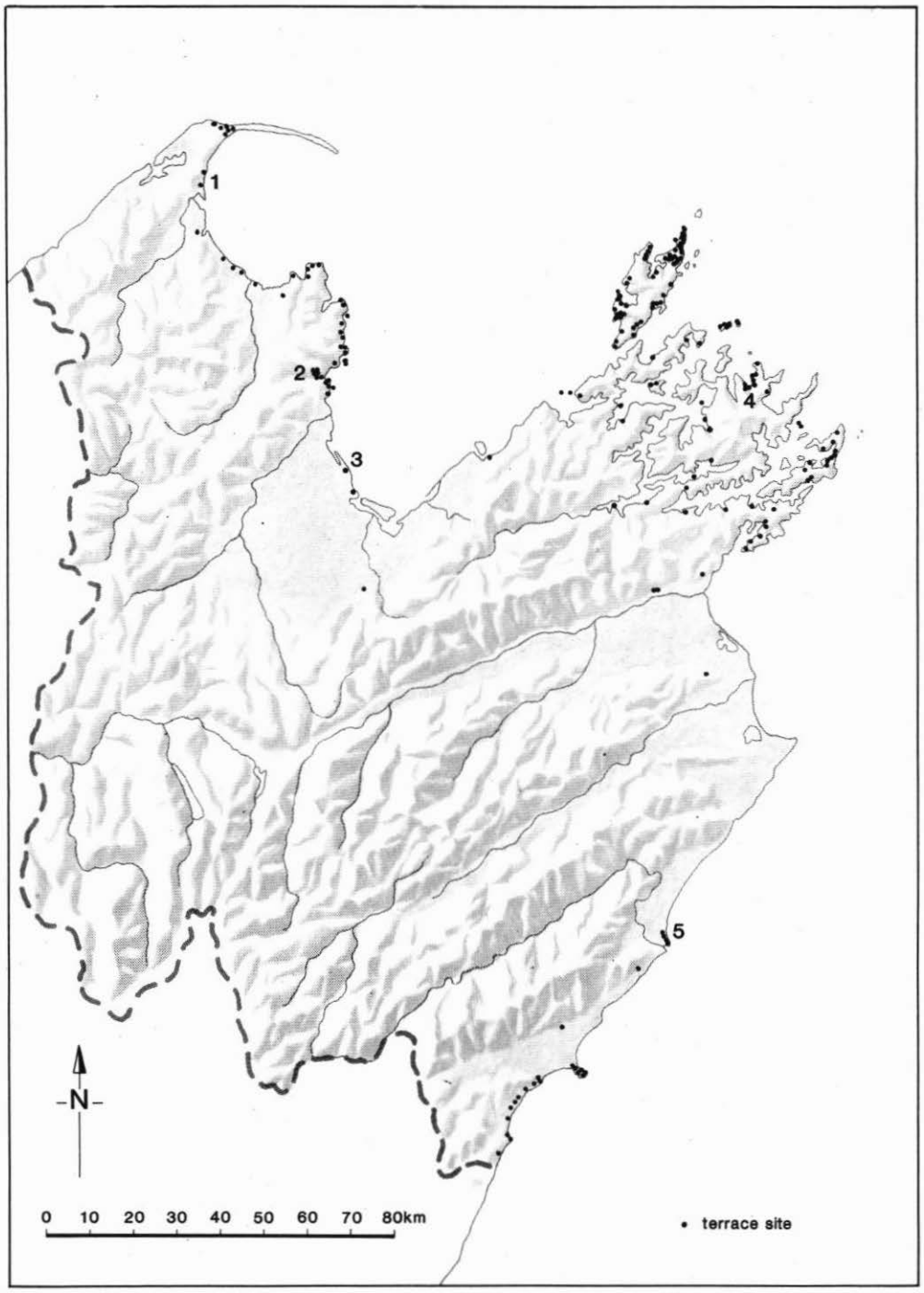

Figure 3: Distribution of terraces. 1. Pakawau; 2. Otuwhero; 3. Moutere Bluffs; 4. Garden Point, Titirangi; 5. South End, Clarence.

European contact were smaller and many were impermanent (Brailsford 1981: 30–31, plate 16a; Prickett 1982: fig. 1).

Rock shelters or caves with occupational material have been excavated at Triangle Valley, Golden Bay (M24/4, D. G. L. Millar excavations 1966), and at Rakautara (P31/10; Eyles 1975) and Whalers Bay (O31/12, Trotter 1982: 101), Kaikoura. Twenty have been recorded in the region. Rock art is known in rock shelters in the Monkey Face area (O31/1–3) and at Campbells Creek (N32/1) in the Conway Valley, and is reported at Tonga Bay (Trotter and McCulloch 1971: figs. 18, 37 and 41).

DEFENDED *PĀ*

Archaeologists usually define a *pā* as a defended site with a feature such as a bank, ditch or defensive scarp. Whether an apparent earthwork feature is of human construction and of defensive intention may be unclear from surface evidence. Sites known as defended *pā* in Maori tradition or from European descriptions may lack features an archaeologist would describe as defensive. For example, Hippa Pa and Hippa Rocks in Queen Charlotte Sound (Q26/9 and Q27/3; Brailsford 1981: 20, 25) appear in the site records as terraces, pits and midden but they were seen by Captain Cook to function as defended *pā*. The analysis presented here is therefore preliminary. Generally cases of doubt have been included. On this basis, 93 defended *pā* are plotted (Fig. 4; Challis 1991a: schedule 2). More are likely to exist. For example, *pā* named Pukatea and Mautuku are known at Whites Bay north of Blenheim but are not yet recorded. All sites are within sight of the sea with the exception of N26/207, a small defensive terrace in the Otuwhero Valley (Foster 1990).

The Groube classification (1970) of defended *pā* has been applied for the purpose of description (plans in Brailsford 1981; Challis 1978; and on site record forms). This distinguishes sites with defensive terraces only (class 1) from sites with ditches and/or banks (classes 2 and 3), and separates sites with ditches and banks in more than one direction (class 3) from those with ditches and banks in one direction (class 2). Any classification on the basis of field remains seen as a static final form can mask multiple phases of defence. European records of Hippa Pa are a reminder that some sites may have had a complicated history: seen by Cook in 1770, abandoned in 1773, rebuilt but deserted in 1779, abandoned in 1820, probably repaired in 1839, and perhaps identified as a railed enclosure in 1843 (Trotter 1987: 113–24).

Pā of class 1 (23 in number) include six examples on islands, five of these in the Marlborough Sounds (e.g., Brailsford 1981: 20, 25, 35) counted on the basis of descriptions of several as defensive sites by Europeans. Others probably exist if these are admissible. The sites are crammed with terraces thought to have been used for built structures, suggesting a regular settlement function. Class 1 sites in the Nelson region are possibilities rather than clear examples (Taupo in Golden Bay, N25/50, ibid.: 82; and four sites near Motueka, Challis 1978: 13; Foster 1990). Eleven sites are listed for the Marlborough coast (Brailsford 1981: 103–45; Fomison 1959: site 3) where site recorders may have been more inclined to accept elevated terraced sites as being defended *pā*. The difficulty of identifying palisade defences from surface evidence means that the apparent absence of class 1 sites may be of little significance.

Pā of class 2 with transverse ditches are the commonest type and are of clearer definition (60 sites). Some occupy cliffline or promontory situations and have no apparent lateral defences or scarps (e.g., Pariwhakaoho, Golden Bay, M25/13, Brailsford 1981: 88; Moutere

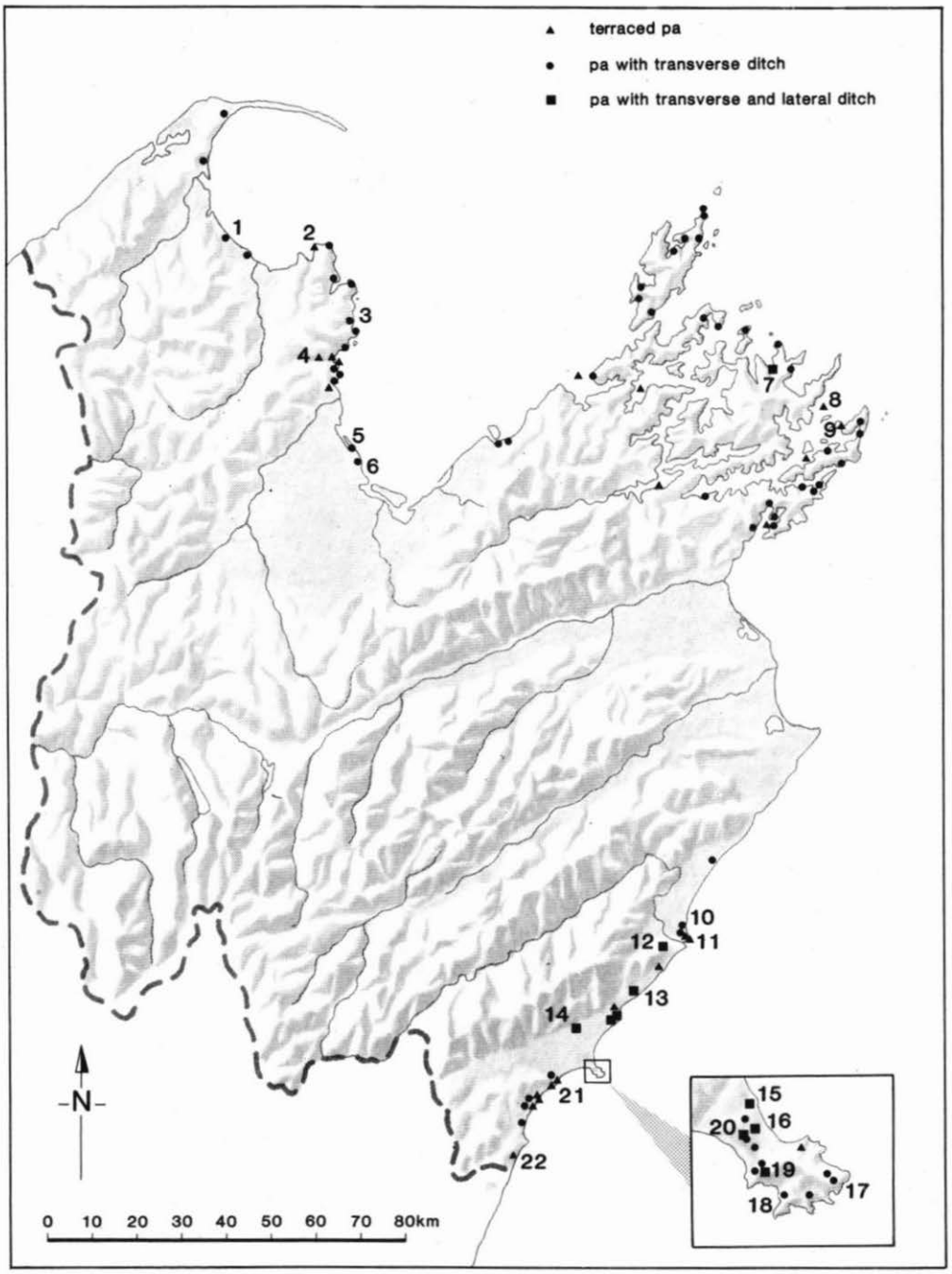

Figure 4: Distribution of defended *pā*. 1. Pariwhakaoho, Puramahoi; 2. Taupo; 3. Frenchman Bay; 4. Otuwhero; 5. Te Mamaku; 6. Moutere Bluffs; 7. Waitui; 8. Hippa *pā*; 9. Hippa Rocks; 10. Garden *pā*; 11. Ridge End, Clarence; 12. Te Puha te Kari; 13. Raukautara; 14. Waimangarara; 15. Takahanga; 16. Nga Niho; 17. Lighthouse *pā*; 18. Atiu, O31/28; 19. South Bay, O31/26; 20. South Bay, O31/23; 21. Peketa, O31/32; 22. Pari Whakatau.

Bluffs, N27/74, Challis 1978: 21; Lighthouse Pa, Kaikoura, O31/10, Fomison 1959: site 8). Most have evidence of interior occupation, although some Kaikoura sites do not and may have been ephemeral citadels (e.g., Atiu Point, Kaikoura O31/28, Fomison 1959: site 9). Others are terraced sites which, without their ditches, might be admitted to class 1 (e.g., Frenchman Bay, west Tasman Bay, N26/21, Brailsford 1981: 84). Some ditches are debatable. There are four clear examples of class 2 *pā* on D'Urville Island (Prickett and Prickett 1976: 8). The Pricketts recorded two other ditches on spurs with pits (P25/55 and P26/93), and two ditched sites have been claimed by other recorders (P25/44 and P26/4).

Groube divided his class 3 *pā*, with transverse and lateral ditch and bank arrangements, into those with associated terraces (class 3b, frequently large and complex) and those without (class 3a, ring ditch type). There are three fine examples of terrace edge class 3a with rectilinear defences on the Kaikoura Peninsula (Nga Niho, misnamed by W. J. Elvy, O31/6; South Bay O31/26; Takahanga, O31/63; Fomison 1959: sites 2, 10 and 1; the first is a type example for Groube 1970: fig. 10), and another forming part of a larger site (South Bay O31/23, Fomison 1959: site 12). North of Kaikoura are two further good examples (Te Puha te Kari, P30/3; Waimangarara, O31/60, Brailsford 1981: 114) and two less distinctive possibilities (P31/17 and 18, ibid.: 113). The outlier in the otherwise Kaikoura coast distribution is Waitui at Titirangi (P26/218), where assignment to class 3 is on the basis that the earthwork defences appear to enclose three sides of the site (ibid.: 48). The sole possible example of class 3b is Rakautara (P31/9), where designation relies on the claim of a lateral bank (ibid.: 108). The distribution of class 3 sites is quite localised on the Kaikoura coast (Fig. 4).

Palisaded *kāinga* on low ground were common in the early nineteenth century. Orchiston has discussed those in Golden Bay and Tasman Bay (1974: 3.167–206), and has tabulated the tribal affiliations of some sites on the Marlborough coast (ibid.: tables 2.4 and 2.5). Taupo Pa and Pakawau Pa, Golden Bay (Brailsford 1981: 81; Brailsford 1984: 43–44), and Te Rauparaha's Pa north of the Wairau river mouth (Brailsford 1981: 71) are known from early European sketches. Substantial stockades are shown. It is not clear whether the fence illustrated at Little Waikawa Bay in 1820 was for defence or for shelter (Trotter 1987: 131). Most Maori settlements seen by Europeans appear to have had palisades. Perhaps the same was true of earlier times.

Excavations at *pā* have given some indication of defensive structures. At the two class 1 sites at Pari Whakatau (O32/20) and Ridge End, Clarence (P30/1), close set palisades of 200 mm diameter posts protected lengthy perimeters (Trotter 1975a: 147–48; Brailsford 1981: 103). At Pari Whakatau a post hole pattern suggested a gateway structure with a fighting platform. The eighteenth century description of the palisades and fighting stage at Hippa Pa (Brailsford 1981: 19) is comparable. At a class 2 site at Peketa (O31/32) excavation through the transverse bank located only one substantial post hole, suggesting that the defence was not finished (ibid.: 132–35). A radiocarbon age for the defence ranges from the seventeenth century to the present (NZ 4502). Excavation of the internal cross wall at Takahanga (class 3a; McCulloch and Trotter 1984: 408–15) located a gateway 1.5 m wide defined by interwoven stakes with a secondary outer timber passageway of right-angled plan which was thought to relate to firearms. A musket ball was found at the inner end. This transverse defence at Takahanga overlay earlier occupation. At Waitui, the site approximating to class 3a at Titirangi, the defensive structure had been built over a former garden wall (Trotter 1977: 16).

Where chronological indicators exist for *pā* they are late. For example, 2B adzes have been found at three class 2 *pā*: Te Mamaku (N27/73 Challis 1978: 22), Pariwhakaoho and

Garden Pa (Brailsford 1981: 87, 101; M25/13 and P30/10); and at class 1 at Pari Whakatau (Duff 1961: 286; for discussion of adzes see below). There are late forms of fishhook from Pari Whakatau (Hjarno 1967: types C3 and D4; Duff 1961: 287) and Peketa (Hjarno type C5a, Brailsford 1981: fig. 20: 2). Bottle glass and a musket ball indicate nineteenth century occupation for class 3 at Takahanga. Pakeha records indicate eighteenth century use of class 1 sites in the Marlborough Sounds. How significant palisaded defences were in earlier times is not known.

MIDDENS

The distribution of recorded midden sites assumed to be pre-European (Fig. 5) is strongly coastal. It shows little concentration related to estuarine systems. Inland occurrences include a freshwater mussel midden at Lake Rotoiti (N29/2, Huffadine 1988; sites also reported in the Travers and Matakitaki valleys but not recorded; freshwater mussel also found at The Glen, O27/13, Walls 1979: 8). The documentation of Maori practice when travelling overland suggests hunting and gathering from stop-over points (Brailsford 1984: 45, 75). Deposits of cockle, mudsnail, mussel and pipi up to 25 km inland in the Motueka district (Challis 1978: fig. 3) indicate that some supplies were carried. Midden and oven sites in the Motueka valley may relate in part to metasomatised argillite exploitation.

Shell middens have been recorded at 650 sites in the region, but exploitation of marine mollusca is not well investigated. Stratigraphic analysis was undertaken by Wellman on D'Urville Island (1962) and Anderson in Tasman Bay (1966). The only excavated material to have been published in detail is from Avoca, Kaikoura (O31/30; Trotter 1980), where discrimination between food remains and the consequences of natural processes was problematic (ibid.: 281, 283; McFadgen 1987: 389ff.). Investigation of site record forms adds to the published evidence, but widespread use of common names may conceal identification difficulties. For example, cockle means *Chione stuchburyi* on D'Urville Island (Prickett and Prickett 1975) and *Protothaca crassicosta* at Kaikoura (Trotter 1980), causing no problems in these reports but casting doubt over the meaning of the common name in others. In assessing the state of knowledge it is better to use common names than to accord spurious accuracy to cursory records. In Golden Bay tuatua is the commonest shell in middens in the north (e.g., Triangle Valley) with some mudsnail, pipi, cockle, catseye and whelk. Mussel predominates in the north-facing Tasman Sea middens. Further south in Golden Bay and along the granite coast pipi is strongly dominant with cockle, mudsnail and catseye frequent and mussel present where available. Among the estuaries and islands of Riwaka, Motueka, Moutere and Waimea the three forms of lagoon shell, pipi, cockle and mudsnail, form the bulk of most middens in varying proportions (Anderson 1966: 49; Challis 1978: 24). On D'Urville Island contrast has been drawn between the overwhelming proportions of pipi, cockle and mussel in middens near the soft shores of Port Hardy; the predominance of paua, mussel and other rocky shore species north of the Port Hardy entrance; and the presence of a wide variety of species including tuatua in Greville Harbour deposits (Prickett and Prickett 1975: 117–25). In Marlborough Sounds middens a wide variety of species is present: cockle, pipi and mudsnail are frequent in sheltered situations, paua and catseye occur near rocky coasts, and the mussel, characteristic of the Marlborough Sounds, is a common denominator (Brailsford 1981: 20–49; Trotter 1974a). In middens on the open Marlborough coast limpet, mussel, Cook's turban, paua and catseye are frequently

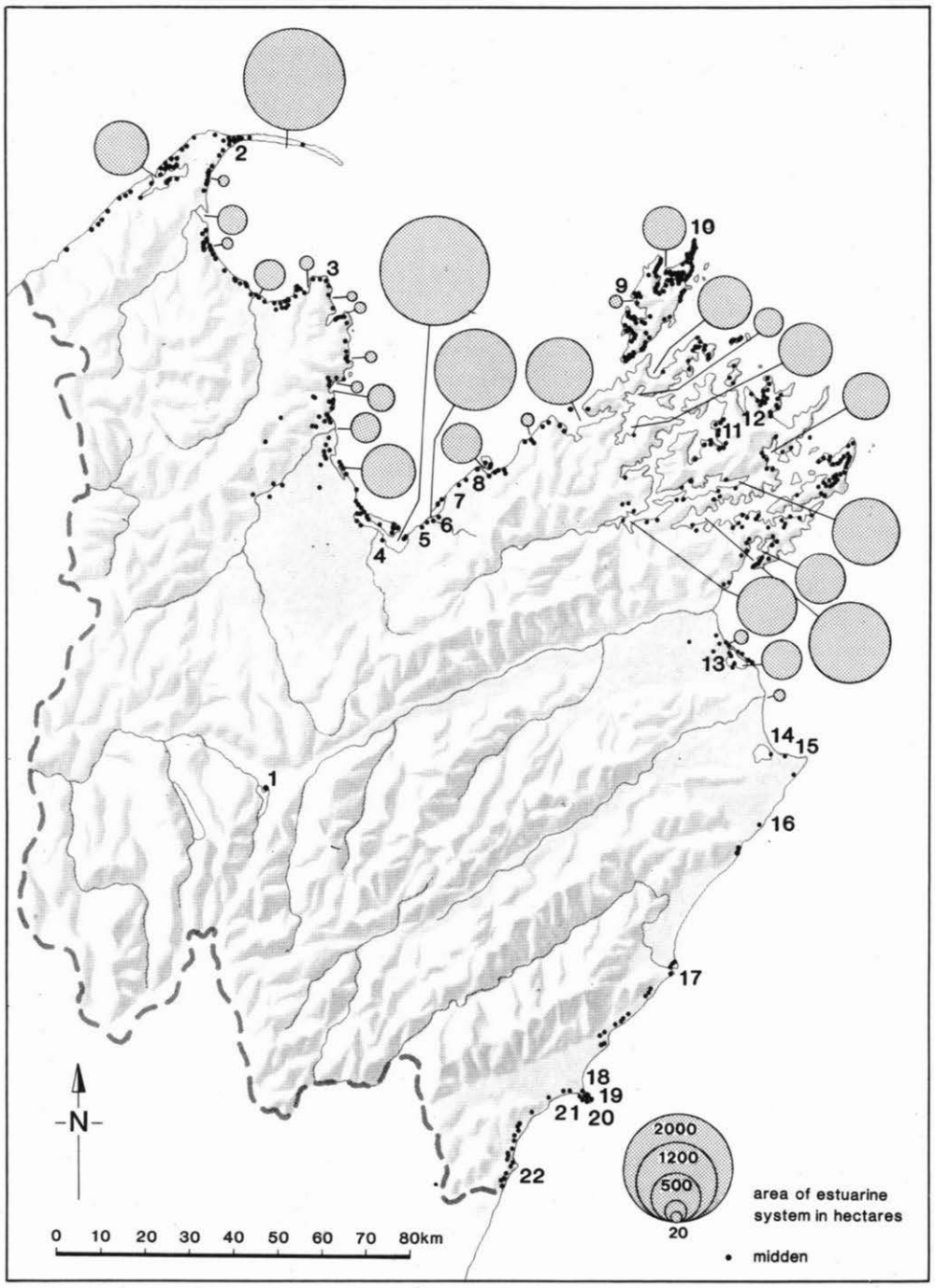

Figure 5: Distribution of middens (estuarine data based on McLay 1976). 1. Kerr Bay, Rotoiti; 2. Triangle Valley; 3. Anapai; 4. Bells Island and Deadmans Island, Waimea Estuary; 5. Tahunanui; 6. Fennel Island; 7. The Glen; 8. Rotokura; 9. Greville Harbour; 10. Port Hardy; 11. Waimaru; 12. Titirangi; 13. Wairau Bar; 14. Marfells Beach; 15. Mussel Point; 16. Needles Point; 17. Clarence River; 18. Takahanga; 19. Avoca; 20. Whalers Bay Cave; 21. South Bay; 22. Pari Whakatau.

found. Rock cockle (*Protothaca crassicosta*) provided over half the deposit thought to be cultural at Avoca (Trotter 1980: 283).

Fish bone has been recorded in 188 middens in the region, distributed throughout but particularly identified on D'Urville Island (81 sites). Detailed analysis of excavated fish bone has been carried out for Rotokura (O27/1, Butts 1977, 1978: 9–10) and Avoca (Trotter 1980: 287; species lists available in these publications). At Rotokura in layer 4 (late thirteenth to early fifteenth century, NZ 1105), out of 122 individuals, 77% were snapper suggesting a dominance of summer exploitation; whereas in the later layer 2 (the uppermost part of which included materials of European origin), among 365 individuals, there was more variety indicating activity throughout the year (snapper 31%, barracouta 22%). Fishing from canoes and the shore with nets and lines is indicated. Snapper appears the dominant fish in other middens around Tasman Bay (Millar 1967; Anderson 1966), whereas barracouta, parrot fish and groper may have been more frequently taken in Marlborough judging by Avoca and South Bay (O31/27; Fomison 1963: 102). Barracouta appears prominent in coastal sites on D'Urville Island (Wellman 1962: 72). Crayfish and squid were eaten in Queen Charlotte Sound in the 1770s (Orchiston 1975: 21). Fishing weirs have been recorded in the Wairau (P28/11, P28/36).

Bones identified as New Zealand fur seal, or in more generalised terms as seal or marine mammal and most likely to be fur seal, have been recorded at 43 sites in the region: 3 in Golden Bay, 9 in Tasman Bay, 14 on D'Urville Island, 3 in the Marlborough Sounds and 14 on the Marlborough coast (Challis 1991a: schedule 3; Challis 1991b: fig. 3). In excavated sites fur seal is present in both earlier and later contexts at Rotokura (Butts 1978: 12–13); in earlier contexts at Anapai (N25/59), Tahunanui (O27/21), The Glen, two sites on D'Urville Island (Wellman 1962: 65, 67), Wairau Bar (P28/21), Clarence River (P30/4) and Avoca (mainly thirteenth to fifteenth century); and in later contexts at Takahanga (O31/5), South Bay and Pari Whakatau (O32/20). This evidence, with the presence of the bones of pups in layer 4 at Rotokura suggesting breeding colonies in the Tasman Bay vicinity, indicates perhaps a wider availability in the earlier period (for detail see Smith 1989: 87). Other types of marine mammal are present in archaeological contexts less frequently, usually in earlier sites (ibid.: 92–98).

Archaeological and ethno-historical evidence of forest foods is rare. Hinau drupes have been found at Waimaru (P26/193, Trotter 1974a: 9). Karaka and tawa berries were recorded eaten in Queen Charlotte Sound in the 1770s (Orchiston (1975: 21).

Both coastal Marlborough and north west Nelson are presented by Davidson (1984: 132) as moa hunting regions, dominated by *Euryapteryx geranoides* and *Emeus crassus* in Marlborough and by *Anomalopteryx didiformis* in Nelson. Lists of moa remains from archaeological contexts (Scarlett 1974: table 3; Anderson 1989: appendix D; Challis 1991a: table 2) indicate some overlap of species. Quantities of moa bone from sites in Nelson and the Marlborough Sounds have been uniformly small (unidentified moa bones recorded from Tasman Bay sites, Anderson 1966; six site records and seven coastal sections on D'Urville Island, Wellman 1962: 62–70; and at the Sandhill site, Titirangi P26/208, Trotter 1977: 9). In all these cases moa bone is associated with the lowest layers in sites and with metasomatised argillite flaking debitage. No moa bone in human association has been found in Golden Bay. In contrast, moa bone quantities were enormous at Wairau Bar (Anderson 1989: 124), suggesting a higher level of moa exploitation in parts of Marlborough. Surface evidence seen in 1971 between Needles Point and Tirohanga Stream was interpreted by Orchiston (1974: 3.93–97) as short term intensive Archaic exploitation of four discrete ecosystems in which moa were abundant, but the human association of moa bones in private

collections is unproven. Radiocarbon ages of sites with associated moa bone focus on the thirteenth to fifteenth centuries (see below).

Bones of birds other than moa have been recorded at 83 sites in the region. Approaching half of these sites are on D'Urville Island. Other concentrations are in eastern Tasman Bay and on the Kaikoura coast. For 9 of the 83 sites, some scientific identifications are available (Challis 1991a: tables 3–5). The list of over 70 species for Marfells Beach (P29/2; Scarlett 1979: 81–83) includes at least 16 species now extinct and 11 beyond their present day range, but the association with human occupation is far from clear. Similar uncertainties of chronology and origin may also pertain to bird bone assemblages from Mussel Point (Q29/1, O. R. Wilkes site record), Deadmans Island and Bells Island (N27/121 and N27/119, R. J. Scarlett site records), Whalers Bay Cave (O31/12, Scarlett 1979), and Needles Point (P29/7, Orchiston 1977: 259). With the exception of Rotokura and Avoca the evidence remaining is scanty and often imprecise. Sea birds appear to have provided the dominant avifaunal component in diet where numbers have been calculated: at Rotokura in the later layer 2, as a percentage of individuals, marine birds 70, forest 20, wetland 10 (Butts 1978: 10–13; for species identifications, see this and other quoted references). Spotted shag dominated in Rotokura layer 4 and at Avoca (Trotter 1980: 286), and albatross and mollymawk were most numerous at South Bay (Wilkes 1964a: 130). Shags, penguins, shearwaters, weka, pigeon, tui and kaka appear widely taken. At Fennel Island in Nelson Haven (O27/54) there was apparently specialised trapping of swans when they were flightless in the moulting season (Anderson 1966: 41–42), a strategy which may also have been adopted near Wairau Bar (Duff 1956: 23) and at Lake Grassmere (Burns 1980: 198). It has been suggested that channels in the Vernon Lagoons, claimed to have been deliberately dug and to date 1750 to 1800, might have been used in this connection (P28/19, P28/47; Skinner 1912; Brailsford 1981: 70–71).

Bones of the polynesian dog have been recorded on 32 sites in the region, and have occurred in all excavated middens. The dog is thought to have been a regular food source (Bay-Peterson 1979; Orchiston 1975: 21). Dog faeces at South Bay (Wilkes 1964a: 130) and in upper layers on D'Urville Island suggest a diet of fish, and in lower layers on D'Urville Island a diet of bones (Wellman 1962: 58).

BURIALS

Wairau Bar (P28/21) is the type site for early burial practice (Duff 1956; Trotter 1975b). Variety amongst the grave goods suggests a relative chronology (Anderson 1989: 125): a group of burials thought to be early (Nos 1–7), all extended, all with perforated moa eggs and moa joints and most with real or imitation whale teeth, bone or ivory reels and adzes (but no nephrite); and a group of burials thought to be late, most crouched, with no moa materials, with whale teeth and reels rarely, but with shark teeth, bird bone tubes and nephrite frequent. Four radiocarbon ages have been determined (ages from human bone are regarded with suspicion): the results for two early group burials focus in the fourteenth century (No. 3, NZ 4442; No. 5, NZ 4443), a late group burial gave a range mid-fifteenth to mid-seventeenth century (No. 35, NZ 4444), and an unclassified burial (No. 42, NZ 1835) gave a range from the eleventh to the fifteenth century.

Investigations by Houghton (1975) indicated an even sex distribution amongst the Wairau Bar burials. Overall, the proportion of males with grave goods is not greater than that of females (Leach 1977). Analysis by Anderson (1989: 125) has shown gender bias in the

distribution of some types of grave goods: moa egg remains, whale teeth ornaments (real or imitation), reels and adzes are more common in male graves. On the basis of 40 individuals, Houghton calculated a mean age at death of 27 for males and 28 for females at Wairau Bar, apparently consistent with prehistoric populations elsewhere. The people had been Polynesian in character, tall, impressively muscled and extremely active. Diet appeared adequate and not significantly abrasive, but tooth wear was identified as a limiting factor in length of life, dental deterioration causing malnutrition and spread of infection.

To the north of Wairau Bar at Kakapo Bay (P27/77) a burial with a pectoral amulet has been recorded (Duff 1956: plate 14B). To the south in Kaikoura (Avoca, O31/30) a burial with adzes and a moa egg was found in 1857 (Dell and Falla 1972), and 15 other burials have been reported in the course of residential development (McFadgen 1987: 382). Wairau Bar burial practice may not have been unique. Also at Kaikoura, two groups of 4 and 9 crouched burials have been excavated (Takahanga, O31/5; Trotter 1974b; Edson 1976). They were in shallow holes beneath occupation deposits characterised by nineteenth century European-derived materials. Three of Edson's group had grave goods (nephrite chisel, pendant and amulet). Radiocarbon ages of human bone from Trotter's group when taken together focus in the fifteenth century (burial No. 1, NZ 4526; burial No. 4, NZ 4464, NZ 4635). Individually the ages are closely comparable with some from Wairau Bar and suggest either that the burial practices may have been contemporary, or that there are problems in radiocarbon dating of human bone. (See Appendix 1 to compare burial No. 1, NZ 4526, with Wairau Bar burial 35, NZ 4444; and to compare burial No. 4, NZ 4464, with Wairau Bar burials 3 and 5, NZ 4442 and NZ 4443.) Other burials on the Marlborough coast are crouched and have been thought to be relatively late in date (South Bay, O31/27, Fomison 1963: 102; Peketa, Brailsford 1981: 132, 134; and Oaro, O32/36). A radiocarbon age for a cremation at Takahanga (NZ 4465) is seventeenth century to modern, and is statistically distinct from the ages determined for the burials. The excavator's interpretation that the Takahanga burials and cremations are all of approximately the same age (Trotter 1974b) confirms that human bone may be a dubious material for radiocarbon dating.

METASOMATISED ARGILLITE

Pre-European exploitation of Nelson metasomatised argillite led to a large volume of tool production and extensive trade throughout the country (e.g., Moore *et al.* 1979). The Nelson Mineral Belt extends for 180 km from D'Urville Island to the Matakitaki Valley. It is an outcrop of metamorphic rocks, principally serpentine (Johnston 1987: 9–13). Inclusions within the serpentine were metasomatised by heat and pressure. Some of these flake with a sub-conchoidal fracture and, being very hard, outcrop at the surface. There are many such outcrops, frequently small. River systems draining the belt contain boulders of the same materials. Preliminary sourcing studies by Dr Alva Challis in the early 1970s indicated a wide variability in contact metasomatisation. Techniques of alkali tracing and X ray diffraction proved promising, but inconsistency within sources suggested that cheap routine scientific sourcing might never be possible. Materials of both volcanic and sedimentary origin were exploited. Geological redefinition and further sourcing studies are required. Meanwhile the term metasomatised argillite remains in use for one of the best known lithic materials in New Zealand archaeology and identifications are by hand specimens. Serpentine was obtained from the same geological area and was used particularly for ornaments.

Metasomatised argillite was exploited from outcrop, surface boulder, excavated pit, stream bed and beach sources (Walls 1974; this paper Fig. 6; Challis 1991a: schedule 4). Outcrop quarries have been recorded at 15 localities on the mainland and 11 on D'Urville Island. Prolonged directed battering with large granodiorite or indurated sandstone hammerstones (up to 55 kg; Duff 1946: plate xxiv), use of wedges, and the excavation of pits for access to the material where appropriate, appear to have been normal breaking out procedure. Trenches or pits occur at the base of outcrops at Mt Ears (P25/103–104), Hebberds (O27/20), Samson Bay (P26/245, Jones 1984: 256) and Askew's Hill (P26/169). On-site preform manufacture has frequently left large quantities of debitage. Use of scattered hill boulder sources, surface and buried, has been recorded at eight localities on the mainland and five on D'Urville Island. The boulders are commonly no more than 1 m^3 in size. Stream and river boulder sources were significant. Over 20 flaking areas have been recorded on the banks of the Motueka River from Golden Downs to the mouth (Challis 1978: 93–95; Bagley 1985), 15 in the north branch of the Maitai River (Witter 1985: 32), and others on the Pelorus River, Big Creek (Chrome Creek), the Lee River and the Matakitaki River (M30/3).

Riverbank flaking floors in the Maitai Valley have been excavated (Witter 1985: 31ff.). Boulders in the river bed were broken out by driving fracture lines with granodiorite hammerstones probably wielded by two men. Suitable blanks were brought to the river bank for flaking into adze preforms. Flake, blade and core blanks have been recognised (cf. Jones 1984: 260–63). Stations of preform stockpiling, core blank reduction, flake blank reduction, preform finishing and unskilled activity probably by children were located (O27/35, the main Maitai site). Radiocarbon ages (charcoal maximum ages, NZ 7545 likely to be of greater inbuilt age than NZ 7544) suggest activity in the late thirteenth century or later. A dozen flaking floors have been recognised within reach of a base camp (Mills Flat, O27/33, also investigated by Witter) where preforms were graded and stockpiled for transport. Mills Flat is 10 km from Auckland Point (O27/49) at the Maitai delta.

Metasomatised argillite debitage appears frequently on coastal sites adjacent to the Nelson Mineral Belt (Fig. 6). On D'Urville Island, flakes and roughouts, often with hammerstones, have been recorded at 115 locations, in association with midden, terraces and pits, frequently behind beaches and in sheltered locations. A similar pattern of coastal working of transported stone is recorded at 30 sites on the mainland from French Pass southwards to the Waimea estuary (e.g., Tahunanui, O27/21, Millar 1971; The Glen, O27/13, Walls 1979; Whangamoa, O26/2; Delaware Spit, O27/14, 17; Oyster Island, N27/120; Bishop Peninsula, O27/6 and 9; Fennel Island, O27/54; Anderson 1966). At The Glen was a cache of 34 unused granodiorite hammerstones. Flake density in the excavations at Tahunanui was over 10,000 per 10 ft square, comparable with 3,341 in 500 x 500 mm at the excavated Maitai site. Water rolled cortex on flakes at Tahunanui indicates material from rivers in addition to other sources. On the basis of hand specimen comparison, stone from local rivers, Mount Ears and Ohana (P26/15-17) was recognised at The Glen, and Kapowai (P26/98) was thought to be the source of material at Delaware Spit. Radiocarbon ages from Whangamoa, Rotokura, Tahunanui and Greville Harbour (NZ 1037, NZ 1105, NZ 1038, NZ 1104, NZ 481, NZ 482) suggest a period of currency for intensive metasomatised argillite working from the thirteenth to the fifteenth century. Wellman found a greater density of debitage in lower occupation layers than in upper on D'Urville Island, and suggested that adze trading rather than manufacture for local use could have ceased by the time the upper layers were formed, which he estimated to be *c.* A.D. 1500 (Wellman 1962: 56).

Working of transported metasomatised argillite was carried out in a broad zone further afield (Fig. 6). In the Marlborough Sounds 130 sites with debitage have been recorded,

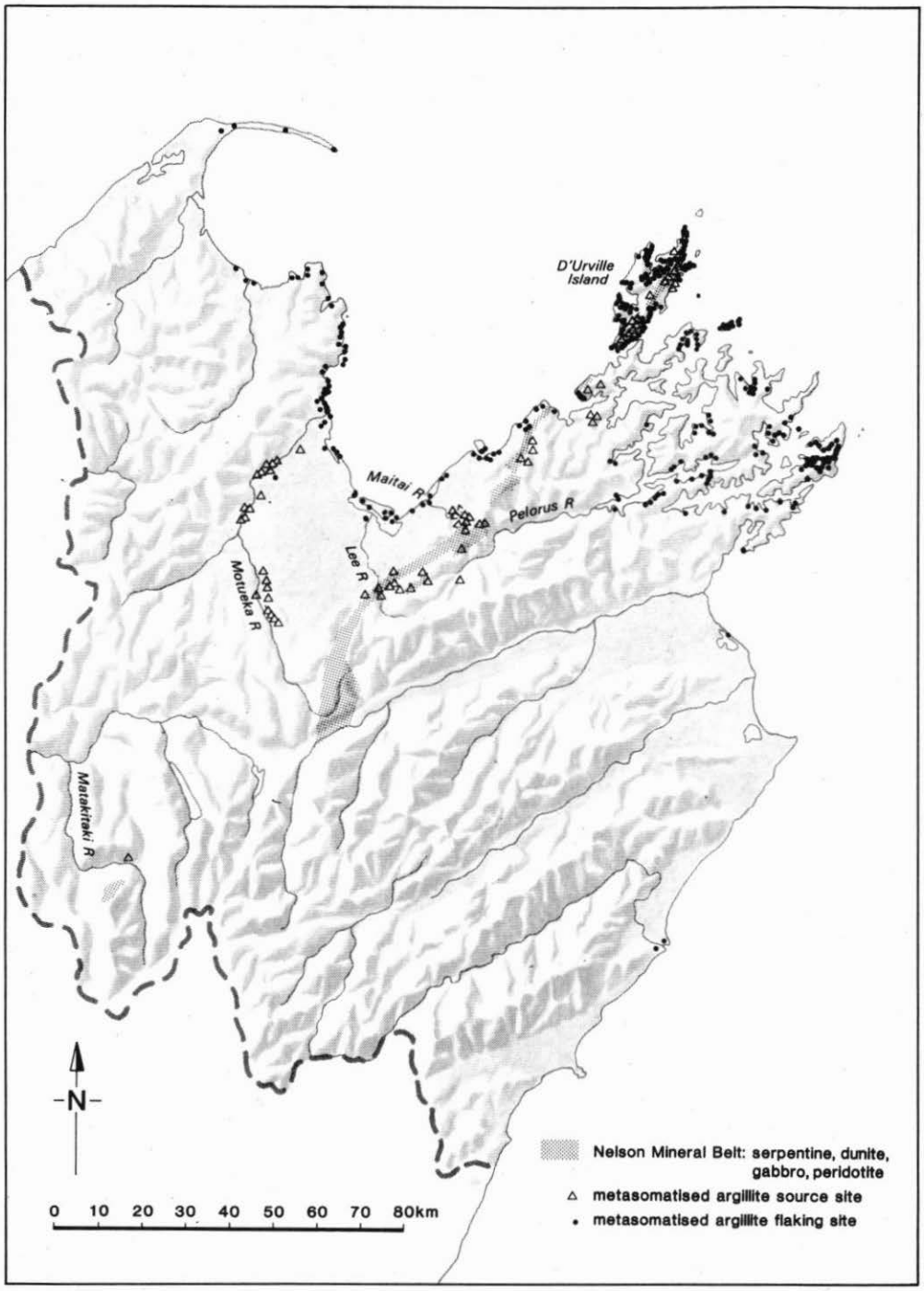

Figure 6: Distribution of metasomatised argillite exploitation (source of geological data: New Zealand Geological Survey 1978).

frequently on north facing beaches, extending from offshore islands such as the Trios and Chetwodes, through Pelorus, Kenepuru and Queen Charlotte Sounds to Tory Channel, Port Underwood and Wairau Bar. At Wairau Bar an estimate of 38.6 tonnes of artefactual stone, most of it metasomatised argillite debitage, indicates to Anderson (1989: 124; figures based on Wilkes 1964b) the manufacture of about 12,000 adzes. This compares with Wellman's estimate that 15,000 adzes were represented in the debitage he saw in exposed sections at Greville Harbour (Wellman 1962: 58–60). At Titirangi, 5,613 metasomatised argillite flakes were found in the excavation at the Sandhill Site (NZ 4236, range eleventh to fifteenth century; NZ 4236 and NZ 4238, ranges fifteenth to sixteenth century; Trotter 1977: 9). Beyond Wairau Bar southwards on the Marlborough coast the material is generally found in small quantities. Similarly in a westerly direction metasomatised argillite debitage has been recognised at sites from Rabbit Island through Mapua and Kina to Riwaka, and at 18 sites in western Tasman Bay (notably Anapai, N25/59, Wilkes *et al.* 1963; Sawpit Point, N26/18; Totaranui, N25/61, Brailsford 1982). It is recorded less frequently in Golden Bay, although on Farewell Spit boulders from the Nelson Mineral Belt have been noted at three sites (M24/14, N24/4, N24/9; Court 1978: 46).

The exploitation of metasomatised argillite therefore involved systems of breaking out stations, preform flaking areas, base camps and transit camps located in the source areas; and extensive preform finishing on coastal settlements both closely adjacent and throughout the region from Farewell Spit to Wairau Bar, within a range of about 100 km (cf. a processing range of 60 km for Tahanga basalt, Davidson 1981: 111). Where dated, components of this pattern appear to have occurred in the thirteenth to fifteenth centuries. Within Tasman Bay the pattern may have persisted (NZ 5415, Totaranui, range late fifteenth to early seventeenth century).

Later superficial exploitation of the main Maitai site has been recognised (Witter 1985: 132). Leach (1990: 388) has suggested that changed social and economic circumstances may have disrupted the adze export trade, so that the material was taken to house sites to be worked. A pattern of use appropriate to this interpretation is apparent on coastal sites in the Motueka district, such as Te Mamaku *pā* (N27/73; Challis 1978: fig. 12), Pukengerengere (N27/108; ibid.: fig. 31), and Pah Point, Riwaka (N26/78; Challis 1976b). In each case water rolled cortex dominates, suggesting that river boulders were transported to the sites, and the predominance of 2B adze forms and the presence of the chin ridge feature suggest a later rather than an earlier date. (For discussion of adzes, see below.) On the other hand there is evidence that substantial quarry workshops were in use in later times. It has been suggested that the southern group of mainland quarries like the Rushpool (O27/22) and Rocky Knob (N28/3) were exploited later than more accessible sources (Walls 1979: 10; Millar 1971: 170), at a time when much of the product was 2B adzes (Walls and Hurst 1979: 63). Exploitation of Motueka Valley sources also continued for some time: unfinished tools from a series of stone working areas suggest a chronological range (Challis 1978: figs. 23–24, 29–30, 42).

Hammerstones recorded associated with the metasomatised argillite industry are of a variety of materials (Walls and Hurst 1979), frequently of granodiorite (18 sites; Challis 1991a: schedule 10) and rodingite (10 sites; ibid.: schedule 11). At 30 sites on D'Urville Island, hammerstones of the local Tramway Sandstone have been recognised. On mainland flaking floors similar sandstone hammerstones may derive from the Maitai and Lee Rivers. Sandstone was itself used rarely for adzes (P25/135, 158, 159).

OTHER LITHIC MATERIALS

Chert occurs in the Amuri Limestone between Cape Campbell and Haumuri Bluff and was used for scrapers, knives and drill points (Moore 1977). It is common on Marlborough coast sites (Challis 1991a: schedule 5), frequently in large quantities (e.g., Takahanga, O31/63, McCulloch and Trotter 1984: 419–21; South Bay, O31/27, Wilkes 1964a: 130–31; Rakautara Cave, P31/10, Eyles 1975: 137; and Avoca, O31/30, Trotter 1980: 288). A chert blade industry has been claimed for Wairau Bar (Simmons 1987b: 166). Only in the case of South Bay has there been an attempt to classify chert by hand specimen according to colours and sources within the Amuri Limestone. Use of river and beach deposits is possible. Chert has been found in small quantities on 14 sites in Tasman Bay and on 9 sites in the Marlborough Sounds, notably on sites associated with the metasomatised argillite industry (e.g., Maitai O27/35; Starveall N28/7; Fennel Island, Oyster Island, Tahunanui, The Glen). Chert is present rarely further west (e.g., M24/28, Nguroa Bay; M25/110, Sandhills Creek) and inland (N29/3, Rotoiti). Whether any of these cherts originate from the Amuri Limestone has not been established.

A pattern of use close to source area is apparent for some other materials, but requires closer geological definition. For example, local quartzite was used for flake tools in western Golden Bay (Walls 1991; Challis 1991a: schedule 6; debitage recorded at 28 sites particularly in the Farewell Spit, Puponga and Whanganui Inlet areas). A metaquartzite outcrop source on Waitapu Hill near Takaka is recorded (N25/42, O. R. Wilkes site record). Quartz thought to have been derived from outcrops in the Separation Point granite is widely distributed in Golden Bay and Tasman Bay sites (typically Anapai and Totaranui), the quantity reducing with distance from possible sources (Wilkes 1960: 29; Millar 1971: 166; Walls 1979: 16; Challis 1978: 54; Challis 1991a: schedule 7). In eastern Tasman Bay local andesite and granodiorite were used for adzes (The Glen and Tahunanui; Walls 1979: 16; Millar 1971: 163; Orchiston 1974: table 2.15, fig. 2.14). In the Clarence area local argillite and fine grained white Amuri Limestone were utilised (Trotter and McCulloch 1979: 3). Orchiston (1974: 2. 64–65) recorded working floors of limestone beach cobbles at Clarence south of the river mouth (P30/4), Wharanui (P30/14) and Needles Point (P29/7), and identified artefacts of the material provenanced from Rotokura to the Rakaia River but concentrated on the Kaikoura coast (ibid. table 2.19). Greywacke appears to have been widely available and used for cutters and pounders (ibid.: 2.84–85), and sandstone likewise for grindstones and hammers. An Onekaka source for schist files found at Totaranui and The Glen (Walls 1979: 16) has been suggested, but the origin of schist at a score of other sites is not assessed. Locally occurring beach stones and boulders of whatever kind were frequently used as pounders and ovenstones. (For a tabulated summary of utilised rocks in the region, see Challis 1991a: table 1.)

Of materials imported into the region, obsidian has been found at over 50 sites including most of those excavated in Tasman Bay and Marlborough, both early and late (Challis 1991a: schedule 12). Numbers of flakes are generally small (Tahunanui is exceptional, 566 flakes; Millar 1971: 163). Sourcing studies (Seelenfreund and Bollong 1989: tables 1–3) have identified Mayor Island obsidian in all of the eight assemblages sampled from the region, and have shown that obsidians from a range of other sources were received throughout the period.

Nephrite appears common in late sites excavated in Marlborough, where unfinished artefacts and greywacke attrition saws have been found repeatedly (Takahanga, McCulloch and Trotter 1984: 407; South Bay, Fomison 1963: 101; O32/20, Pari Whakatau, Duff 1961:

285; O31/16, Peketa, Brailsford 1981: 133). However, scarf sawn nephrite is present in supposedly earlier contexts at Wairau Bar (Duff 1956: 236), Tahunanui (Millar 1971: 168) and Lagoon Flat (O32/31, Davidson 1984: 100). At Titirangi (Trotter 1977: 9; bottom level) it was apparently flaked. The exploitation of nephrite from the Nelson Mineral Belt has also been suspected (Davidson 1984: fig. 23; Beck 1984: 60–62).

Other materials from further afield have been recorded less frequently. A red tuff probably from Banks Peninsula was identified at Pari Whakatau (Trotter 1975a: 150). Orthoquartzite and chalcedony presumably from southern sources have been recorded from seven Marlborough coast sites (Challis 1991a: schedules 8 and 9), and orthoquartzite once on D'Urville Island (P25/22, N. and K. Prickett site record).

Knives and scrapers of pre-European type but in bottle glass are known from the region (e.g., J. Y. Walls pers. comm., Golden Bay; and Q26/6, Cannibal Cove, Trotter 1987: 136, 6e). Apparently on Cook's first two voyages the Maori had sought empty bottles, but by 1820 bottles had little trade value (ibid.: 126–27).

ADZES

Adzes and fishing gear contribute a successful dimension of relative chronology. (For ornaments and weapons see Duff 1956; Skinner 1974; Orchiston 1972, 1974; Walls 1976; Prickett 1985; Leach 1983; for ethnographic collections from Queen Charlotte Sound see Simmons 1981, 1987a, 1987b; Trotter 1987.)

It has been concluded that a range of archaic adze forms often finely flaked and polished in metasomatised argillite, as defined at Wairau Bar (Duff 1956: 139ff.), gave way in later times to the common 2B form, often hammer-dressed in a wider variety of materials (Davidson 1984: 93). Leach (1990: 388–89) has suggested that this change was in part a consequence of the decline of the professional archaic adze export trade necessitating the use of various other locally occurring materials, and in part a consequence of a technological change in favour of hammer-dressing which may have been more versatile, required less expertise, and entailed less risk of breakage. There is evidence of typological change over time in the Nelson–Marlborough region, but the question of technological change is not so clear.

Rotokura provides a stratified typological sequence. In layer 2A (uppermost cultural deposit, with European material) the five complete adzes are all unfinished type 2B (typology following Duff 1956) with some form of chin ridge, exhibiting flaking but very extensive hammer-dressing (Fig. 7E–G). Fragmentary adzes (25 in number) are all similar. The one complete adze from layer 2B is a finished type 4 in greywacke (others discussed here are metasomatised argillite), flaked and extensively hammer-dressed and polished to a rounded rather than angular cross-section (Fig. 7D). Two fragmentary examples are similar. Layer 4 (radiocarbon age late thirteenth to early fifteenth century, NZ 1105) produced unfinished adzes: two type 2A and a small 4A (Fig. 7C), extensively flaked with some minor hammer-dressing of flake ridges, very similar in character to adzes from Wairau Bar (Duff 1956: plate 28A, 2). In the bottom layer 6 at Rotokura were two flake adzes, narrow quadrangular and triangular in section with no hammer-dressing evident (Fig. 7A–B). Layers 5 and 3 at Rotokura were sterile, probably representing periods of abandonment (Butts 1978: 9). In particular, layer 3 was clay slip material from the hillside (D. G. L. Millar pers. comm.). The distinction between layers 2 and 4 is therefore clear, and the time

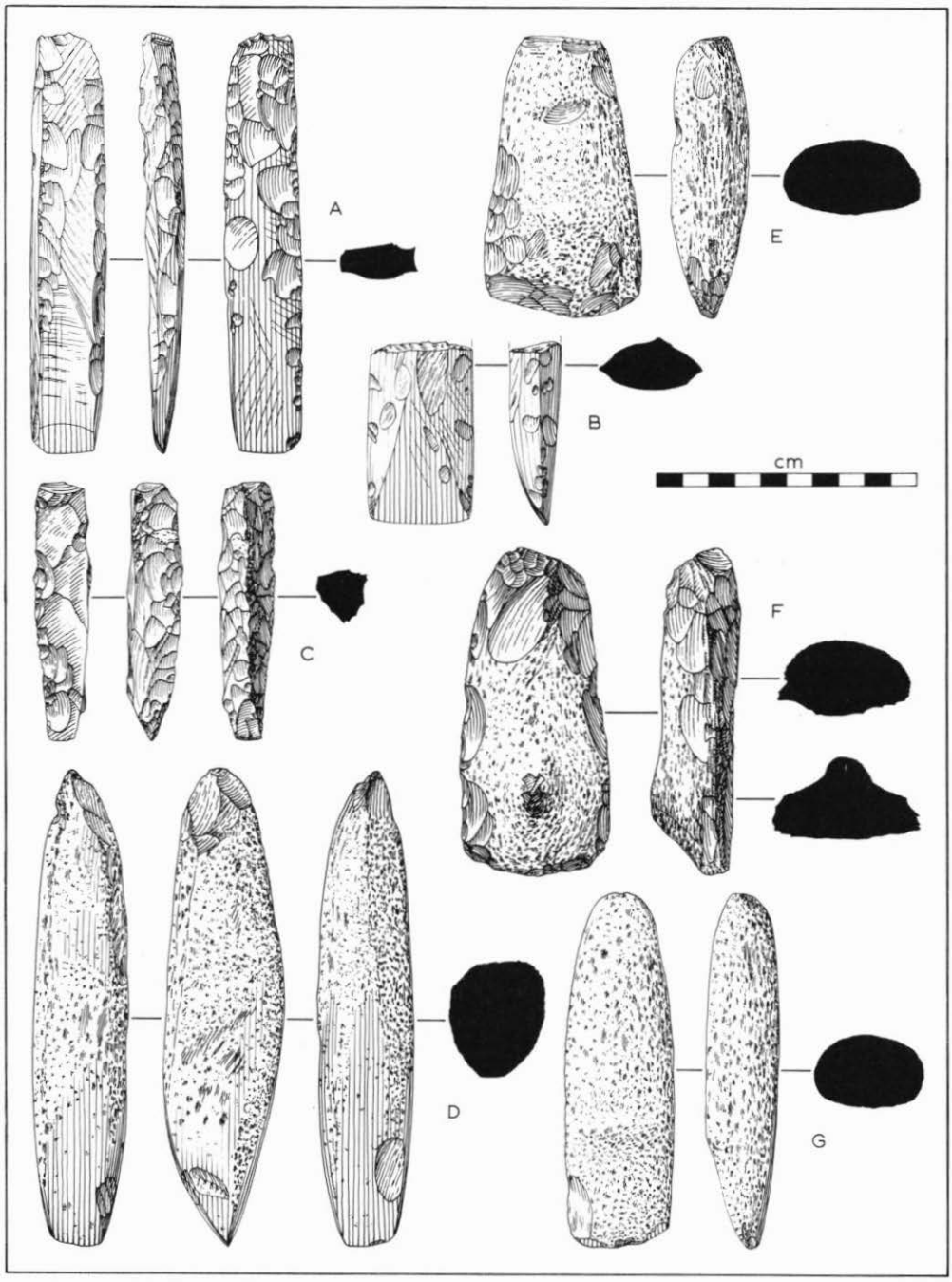

Figure 7: Stone artefacts, Rotokura (A–B layer 6; C layer 4; D layer 2B; E–G layer 2A). A. RK/1858; B. RK/1861; C RK/545; D. RK/486 or RK/488; E. RK/766; F. RK/988; G. RK/672.

lapse from layer 4 to layer 2A may exceed four centuries. The change at Rotokura from earlier flaked Wairau Bar forms to later extensively hammer-dressed 2B forms appears clear.

Material from Tahunanui has similarities with Rotokura layers 4 and 2B: adze types 1A and 4A are most numerous, with hammer-dressing confined to flake ridges as in Rotokura layer 4; and there is a deep sectioned hammer-dressed type 4A as at Rotokura layer 2B. Apparently many of the adzes at Tahunanui had broken during hammer-dressing on the site (Millar 1971: 167). At The Glen were a range of Duff types including a single 2B, completely hammer-dressed and ground (Walls 1979: 12). There may be some time depth in both these sites.

Caches of adzes found in the Motueka district are internally consistent typologically and can be seen to relate to a similar path of change, from sharp Wairau Bar types, flaked with some hammer-dressing to reduce high parts (e.g., Pokororo Bridge, Challis 1978: figs 29–30; Riwaka Wharf, ibid.: fig. 43C, D), to more rounded 2B forms with extensive hammer-dressing (e.g., ibid.: figs. 12, 23, 24, 31). Distinction can be made between earlier and later forms of types 2A and 4A (ibid.: 68ff.), the later 2A shallow with a chin ridge, typical of the Nelson region (Scarlett 1967: 223–24, quoting Roger Duff), and the later 4A with a rounded cross-section (as described for Rotokura layer 2B), both extensively hammer-dressed. Marlborough sites thought to be relatively late have consistently produced 2B forms in argillite (e.g., Pari Whakatau, Duff 1961: 286) and nephrite (e.g., Matariki P30/2 and Peketa O31/15–16, Brailsford 1981: 104, 133). Adzes with chin ridges have been found throughout the region (e.g., Challis 1978: figs. 35, 44; Brailsford 1981: figs. 48.2, 48.3, 56 and 75).

The theory that hammer-dressing as a technique for all-over preform finishing was common later, but that in earlier times its use was limited as an adjunct to flaking technique, has received some support in the foregoing discussion. At the Samson Bay quarries hammer-dressing was limited to reducing high points (Jones 1984: 263), and at flaking floors in the Maitai Valley it was used to test preforms prior to flaking (Witter 1985: 54). However, high quality type 1A adzes are known finely hammer-dressed on all surfaces except the cutting edge (e.g., Heaphy River, Scarlett 1967: 223–24; Pokororo, Challis 1978: fig. 42). This suggests patterns of technical individuality rather than uncomplicated change over time.

FISHHOOKS

The Hjarno classification of fishhooks (1967) is the most helpful for application to Nelson–Marlborough assemblages. The Rotokura sequence (stratification discussed above) is again a useful starting point (see Fig. 8). The oldest layer 6 has one-piece bait hooks D1 (Fig. 8A). Layer 4 (late thirteenth to early fifteenth century) has D1 (Fig. 8B–D), minnow lures B1 (Fig. 8E), two-piece bait hooks with perforations for lashing D5b (Fig. 8F–G), and two-piece bait hook points notched for lashing, curved C1a (Fig. 8H) and straight C1b (Fig. 8J). Layer 2B omits minnow lures B1 but adds barbed two-piece bait hook points C3 (similar to Fig. 8Z). Layer 2A (European contact) retains only barbed type C3 from previous layers (Fig. 8Y, Z, b) and has serrated two-piece bait hook points C5a (Fig. 8d), plain barracouta points A1 (Fig. 8f), one-piece barbed D4 (RK/675, not illustrated), and one-piece knobbed and carved D1b (Fig. 12e). There appears to be a clear change from early one-piece bait hooks, minnow lures and unbarbed two-piece hooks, to late barbed, knobbed

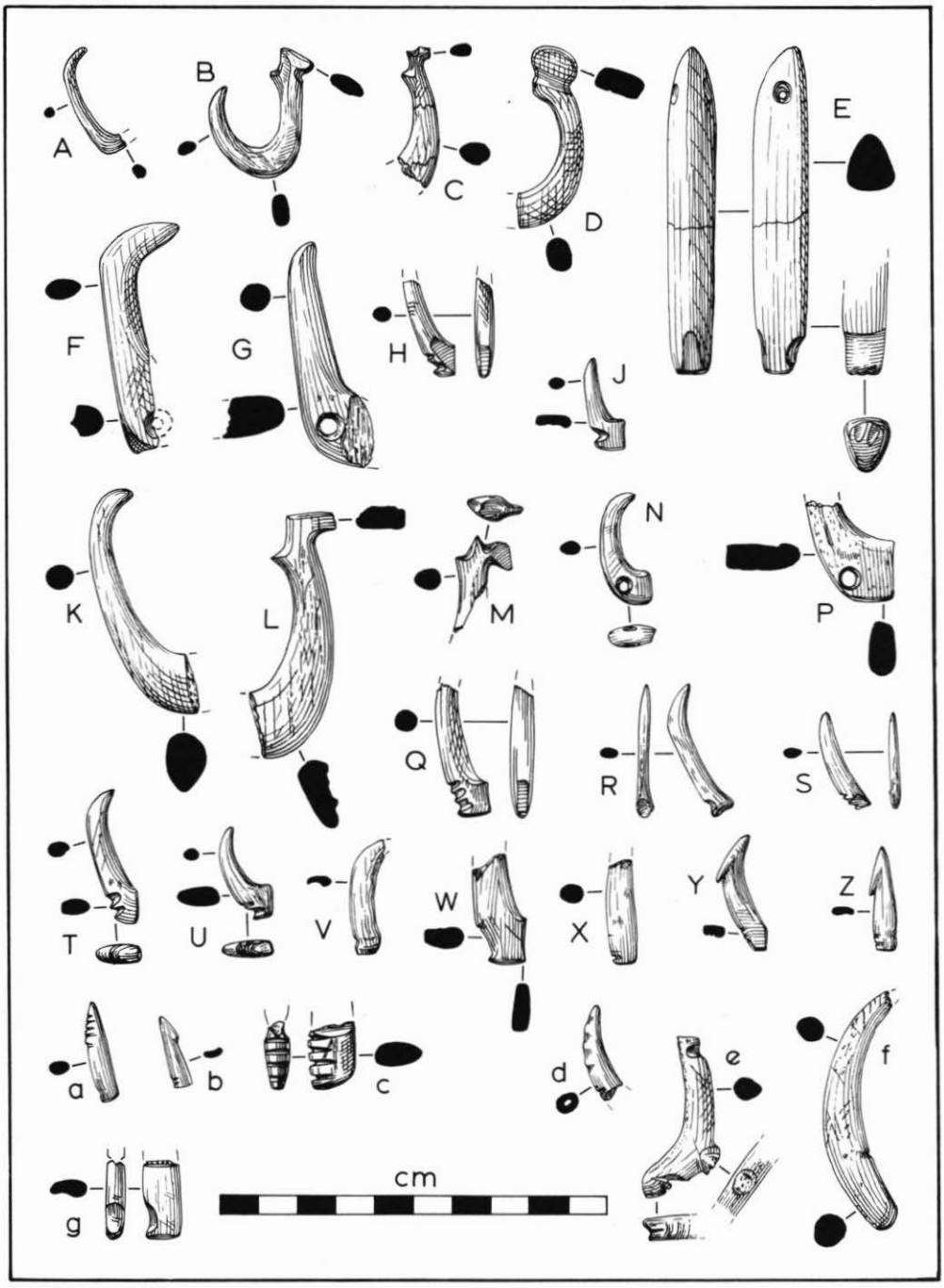

Figure 8: Fishhooks, Rotokura (A layer 6; B–J layer 4; K–X layer 2B; Y–g layer 2A). A. RK/1281; B. RK/667; C. RK/1276a; D. RK/472; E. RK/1124; F. RK/669; G. RK/725; H. RK/893; J. RK/1856; K. RK/1677; L. RK/1811; M. RK/1561; N. RK/1204; P RK/1112; Q. RK/375; R. RK/1774; S. RK/29; T. RK/1249; U. RK/835; V. RK/752; W. RK/1814; X. RK/1503; Y. RK/946; Z. RK/1740; a. RK/17; b. RK/1025; c. RK/1670; d. RK/217; e. RK/1699; f. RK/1872; g. RK/1694.

and serrated one-and two-piece hooks and barracouta points. (Note that barracouta made up 21.6% of fish individuals in layer 2, but only 2.5% in layer 4; Butts 1978: 9–10).

Other assemblages are consistent with this trend. Wairau Bar (Duff 1956: figs. 52–54), Clarence (P30/4, thirteenth to fourteenth century, NZ 1836, Trotter and McCulloch 1979: 4) and Tahunanui (thirteenth to fifteenth century, NZ 1104, Millar 1971: 165) have one-piece bait hooks D1 and minnow lures B1, thought to be components of earliest fishing gear. Tahunanui adds the two-piece bait hook perforated for lashing D5b, thought to be a development characteristic of Tasman Bay (also found at Onatea P27/116; and Jacketts Island, N27/54, Challis 1976c: fig. 2B). The Glen retains this range and adds plain barracouta points A1 (Walls 1979: 15). At Whalers Bay Cave (O31/12) continued use of the one-piece D1 (in green mussel, *Perna canaliculus*) through to the currency of barbed two-piece hooks C3 and serrated one-piece hooks D1a is suggested (Trotter 1982: 101). The late Rotokura layer 2A barbed and serrated forms are found at other later sites in Marlborough: Pari Whakatau (C3 and D4 with A1; Duff 1961: 287–288), Peketa (C5a; Brailsford 1981: 133), Matariki (C3; ibid.: 104), and Waipapa Bay (C3, serrated and multi-barbed C4, C5a, A1 and lugged barracouta point A3; ibid.: 108). At Takahanga serrated and knobbed forms (A1 with knobbed foot, A3 and D1a) have been found in a European contact context (O31/5, Trotter 1974b: fig. 5). Triangle Valley rock shelter, Puponga (M24/4), produced a serrated barracouta point A2. The Rakautara Cave (P31/10, Brailsford 1981: 111) and Grassmere (Robson 1876) assemblages may be of mixed age. Other promising excavated assemblages have not been published (e.g., Titirangi, Trotter 1977: 9; South Bay, Fomison 1963).

In summary, one-piece bait hooks D1 may have had long currency, in moa bone earlier and shell later. Minnow lure hooks B1 and unbarbed two-piece hooks perforated (D5b) and notched (C1a and C1b) for lashing are not recorded in later assemblages. Barracouta points A1 may have had long currency, and with two-piece barbed points C3 appear at an intermediate stage. All other forms of barbed (C3, D4), serrated (A2, A3, C4, C5a, D1a) and knobbed (A3, D1b) hooks are not found in early contexts but are present later. These conclusions are compatible with the Hjarno analysis developed for the southern South Island, and are supported by the collection of barbed and serrated bone points from Queen Charlotte Sound in 1820 (Simmons 1987a: 57).

RADIOCARBON AND THE DATE OF FIRST OCCUPATION

Radiocarbon age determinations of archaeological relevance (Appendix 1) are considered here as calibrated ages with a 95% confidence interval (Stuiver and Reimer 1986), using terminology as defined by McFadgen (1982). Assessment on the basis of any narrower less probable interval is seen as insupportable both on statistical grounds and also because of problems of inbuilt age, depositional uncertainties, and the question of the reliability and comparability of ages derived from particular materials. Further study of these issues may allow closer definition.

Twelve of the ages listed in Appendix 1 are for Avoca, Kaikoura. Seven of these (NZ 2716–2720, NZ 3164 and NZ 4155) are from squares 9–10 of Trotter's excavations (Trotter 1980: 281). NZ 3164 was discounted by Trotter as too old (ibid.: 283–84). A charcoal age of the sixth millennium B.C. in the same batch as some from squares 9–10 (NZ 3827) emphasises the problem. The remaining charcoal, moa bone and marine shell ages (NZ 4155, NZ 2716, NZ 2718 and NZ 2719), when calibrated, give ranges of time which are

mutually compatible and focus in the twelfth to thirteenth centuries. Squares 9–10 were on McFadgen's beach ridge D (McFadgen 1987: fig. 2), and the twelfth and thirteenth centuries are comfortably within its period of formation (sixth to sixteenth century; ibid.: fig. 4). Three other radiocarbon ages for Avoca are from McCulloch's excavation of a linear stone feature thought to be of horticultural relevance (McCulloch 1982: 2) 50 m east of squares 9–10. These ages range from the thirteenth and fourteenth (NZ 6566, moa bone) through the fourteenth and fifteenth (NZ 6496, moa bone) to the fifteenth and sixteenth centuries (NZ 6525, marine shell). The site is on McFadgen's beach ridge C, the formation of which is thought to have occurred in the fourteenth to sixteenth century (NZ 6472, McFadgen 1987: 385). Overall it appears that there might have been two occupations of the Avoca locality between the twelfth–thirteenth and the sixteenth centuries.

Interpretation of the radiocarbon ages from Wairau Bar is hindered by lack of published data on sampling context. A duplicate pair of charcoal ages (NZ 50 and Y 204) when taken together focus on the eleventh to the thirteenth centuries. They apparently derive from layer 4 on the site, which is stratigraphically subsequent to early burials (Anderson 1989: 123; Orchiston 1971: 185). They are maximum ages of unknown inbuilt age. Ages for moa bone and shell (NZ 1837 and NZ 1838) from midden deposits are mutually compatible and focus on the late thirteenth to early fifteenth centuries. The age ranges for burials (determinations from human bone may be unreliable) run from eleventh to the mid-seventeenth centuries (NZ 1835, NZ 4444), with early burials focussed in the fourteenth century (NZ 4442, NZ 4443). On this basis it appears that a main cultural layer at Wairau Bar may relate to the thirteenth to fifteenth centuries, and that some activity may have been earlier than this. How much earlier is not yet established.

Radiocarbon ages of marine shell (which may be close ages; McFadgen 1982: 387) for other sites associated with moa bone are thirteenth to fourteenth century for Clarence (P30/4, NZ 1836), thirteenth to early sixteenth century for Moawhitu, Greville Harbour (NZ 482), and a bracket from the mid-fifteenth to the early sixteenth century for the lowest occupation layer at the Sandhill Site at Titirangi (NZ 4237, NZ 4238, NZ 4239). A moa bone sample from the Sandhill Site (NZ 4236) has a particularly broad range. Maximum ages from charcoal (unknown inbuilt age) from sites with moa bone are late twelfth to fourteenth century at Whangamoa (NZ 1037), late thirteenth to early fifteenth century at Rotokura (NZ 1105), and late thirteenth to seventeenth century at Tahunanui (two dates, NZ 1104 and NZ 1038, from differing parts of the site). These results suggests a generality of occupation commencing around the thirteenth century.

Taking the evidence from these sites and from Avoca and Wairau Bar together, occupation would appear securely established by the thirteenth century. Some activity is arguable for the twelfth century. Human presence earlier than this, while statistically possible within the two standard deviations of some radiocarbon ages, is considered unproven at this stage. Anderson (1966: 75–76) located several midden and working floor sites dispersed on the fringes of Tasman Bay which he thought were possible candidates as sites of early colonisation, but no radiocarbon ages are available from them (e.g., Oananga, O26/14; Anapai, N25/59).

It has been customary to envisage first human occupation of New Zealand by A.D. 1000. Simmons (1969: 21) thought that Nelson and D'Urville Island might have been the initial focus of mobile sea-borne bands of early settlers. More recently, Caughley (1988) has suggested a radial expansion of settlement from initial colonisation based on the north east coast of the South Island but Anderson and McGovern-Wilson (1990) disagree. It would be tempting to suggest occupation in Marlborough (Wairau Bar, Avoca and Titirangi) as early

as A.D. 1000 to 1100, and in Tasman Bay (Maitai Valley and Whangamoa) as early as 1050 to 1200. However, the wide standard deviations of radiocarbon dates, problems of inbuilt age, uncertain reliability and comparability of ages from samples of different types, unpublished stratigraphic context in many cases, and depositional uncertainties in others, cannot be glossed over. Few sites have been sampled, and there are large areas from which no radiocarbon dates have been obtained. On the basis of present evidence, any discussion of the sequence of colonisation within the Nelson–Marlborough region, or more detailed wheedling over the date of its first settlement or its relative priority compared with other regions, appears to the present writer to be premature.

SYNTHESIS

Any interpretation of culture history is constrained by limitations in the available data. In the Nelson–Marlborough region these limitations are severe (discussed in Challis 1991b): site distributions reflect uncomprehensive site recording and the impact of land use in the historic period; and excavations have been small in scope and most are incompletely published. In this synthesis a little has been said on most subjects. All demand further recording, classification and investigation, particularly horticultural history, systems and adaptations; the nature, function and chronology of settlements, particularly defended *pā*; the extent and ecological consequences of hunting and gathering, particularly for shellfish, fish, birds and marine mammals; and the geological definition, chronology and networks of lithic exploitation. Precise identification of materials is crucial. The links between different forms of evidence (e.g., horticulture, pits and *pā*) and the relative importance of different foods at various times (e.g., moa, horticulture, forest resources) are not well established. Any conceivable research project has the potential of overturning the current preliminary synthesis.

Early activity in the region may have been focused in coastal environments affording large bird populations, marine mammals and good fishing, perhaps in the twelfth century. In the thirteenth to fifteenth centuries coastal occupation was widespread including places of intensive activity. Horticulture may have been well established using Maori plaggen soils. There were specialised bird kill sites. Moa may have become depleted. It is likely that the interior was well explored. Large scale metasomatised argillite exploitation and associated artefact trade involved breaking-out quarries, flaking stations, temporary base camps and transit camps linked to semi-specialised coastal settlements in eastern Tasman Bay and on D'Urville Island. The material was transported for flaking as far as Farewell Spit and Wairau Bar, and trade networks were very extensive, suggesting ease and freedom of movement. Some typological development of artefacts is recognisable, such as two-piece bone fishhooks and ornament forms.

By the sixteenth century, moa might have been unobtainable. Horticulture may have been increasing on Tasman Bay lowlands and in coastal Marlborough, suggesting substantial settled populations. Some stone rows and storage pits may relate to this time. Metasomatised argillite exploitation continued, using river sources such as the Motueka and probably inland quarries. Developments in artefact typology included a change to more rounded forms for the adze kit.

By the seventeenth to eighteenth century, settlement systems included elevated terraced sites and defended *pā*. Permanent rectangular porched houses, dwellings in shallow pits and scoops and overnight shelters were constructed. Diet included fish, shellfish, mamaku (tree

fern) and bracken fern root, birds, berries, dogs and horticultural produce. Horticulture may have declined in some areas in less settled social circumstances. Local stone was used for local requirements, and some inter-regional exchange was accomplished. Artefacts included the 2B adze, frequently with the chin ridge feature, a variety of barbed and serrated fishhooks, and the range of weapons and ornaments documented ethnographically.

By the early nineteenth century European influence had become dominating. Horticulture increased with potatoes, indian corn and other introduced crops. The Ngati Toa invasions (Burns 1980: 146, 165) resulted in discontinuity in settlement. Some areas were depopulated. Coastal lowland *kāinga* defended by stockades were frequently seen by Europeans.

In general throughout the period the main theatre of activity was the coastal zone. This afforded ease of movement, the opportunity of horticulture, and resources for hunting and gathering. By comparison the interior was austere and impoverished, searched and exploited for specific requirements. Dry sheltered coastal sites with easy access to the sea, river, swamp, cultivation and forest are likely to have been a common denominator in settlement patterns. These are places where stratified evidence of successive occupation may be found (e.g., Titirangi P26/208, Rotokura O27/1). These sites and others like them hold promise of defining and refining sequences of cultural change.

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APPENDIX 1. RADIOCARBON DATES

Site	Lab. No.	Conventional age BP	95% confidence interval, calibrated AD	Comments
M25/10 Parapara Spit	NZ4505	843 ± 33	1409–1524	*Paphies subtriangulatum*, Division 2 ground soil midden. McFadgen and Challis 1979: 144.
M25/10 Parapara Spit	NZ4506	818 ± 40	1413–1577	*Paphies australe*, Division 2 buried midden. McFadgen and Challis 1979: 144.
N25/61 Totaranui	NZ5415	776 ± 33	1451–1620	*Paphies* sp., site B. Brailsford 1982: 14.
N26/80 Whakarewa Street	NZ3307	825 ± 70	1042–1289	Unidentified charcoal, pit 1 layer A12. Challis 1976a: 252.

N27/93 Grossis Point	NZ1039	972 ± 71	1271–1472	Marine shell, Anderson 1966: 72. A1 midden.
N27/122 Waimea West	WK1776	360 ± 50	1458–1649	Charcoal, matai bark, base of borrow pit. B.G. McFadgen pers. comm.
O27/21 Tahunanui	NZ1038	442 ± 70	1408–1639	Unidentified charcoal, A1 oven. Anderson 1966: 72.
O27/21 Tahunanui	NZ1104	594 ± 70	1284–1441	Unidentified charcoal, oven 1. Millar 1971: 170.
O27/35 Maitai Valley	NZ7544	620 ± 50	1287–1416	Charcoal, probably mostly small sticks, BL 2 hearth. Witter 1985: 105.
O27/35 Maitai Valley	NZ7545	896 ± 95	1001–1281	Charcoal, large branches or old logs, BL 6 umu. Witter 1985: 107.
O27/1 Rotokura	NZ1105	586 ± 57	1291–1435	Unidentified charcoal, layer 4. Butts 1978: 9.
O26/2 Whangamoa	NZ1037	748 ± 72	1170–1399	Unidentified charcoal, A1 oven (bottom). Anderson 1966: 72.
P25/100 Moawhitu	NZ481	674 ± 90	1223–1437	Unidentified charcoal from outside of charred log, lower occupation layer, section D. Wellman 1962: 58–63; Anderson 1989: 224.
P25/100 Moawhitu	NZ482	961 ± 88	1246–1511	Marine shell, lower occupation layer, section B. Wellman 1962: 58–63; Anderson 1989: 223.
P25/95? Port Hardy	NZ483	716 ± 67	1454–1690	*Paphies subtriangulatum*. Wellman 1962: 69–70?
P26/208 Sandhill site	NZ4236	792 ± 148	990–1434	*Euryapteryx geranoides* collagen, lowest occupation layer. Trotter 1977: 9; 1982: 90–91.
P26/208 Sandhill site	NZ4237	847 ± 40	1395–1537	*Mytilus edulis*, lowest occupation layer. Trotter 1977: 9; 1982: 90.
P26/208 Sandhill site	NZ4238	820 ± 40	1412–1574	*Lunella smaragda*, lowest occupation layer. Trotter 1977: 9; 1982: 90.

P26/208 Sandhill site	NZ4239	762 ± 56	1445–1651	*Paphies subtriangulatum*, lowest occupation layer. Trotter 1977: 9; 1982: 90.
P26/208 Sandhill site	NZ4240	625 ± 41	1541–1798	*Mytilus edulis*, uppermost occupation layer. Trotter 1977: 9; 1982: 90.
P26/208 Sandhill site	NZ4241	637 ± 67	1495–1830	*Paphies subtriangulatum*, uppermost occupation layer. Trotter 1977: 9; 1982: 90.
P26/217 Cattleyard Flat	NZ4498	706 ± 26	1508–1659	Marine shell, variety of species, from interior of stone–covered mound. Trotter 1977: 12–13.
P26/217 Cattleyard Flat	NZ4499	758 ± 45	1456–1644	*Haliotis iris*, from interior of stone–covered mound. Trotter 1977: 12–13.
P28/21 Wairau Bar	Y204	935 ± 110	898–1281	Unidentified charcoal, cooking pit, upper of two layers. Trotter 1975b: 79–80.
P28/21 Wairau Bar	NZ50	909 ± 48	1033–1239	Unidentified charcoal, cooking pit, upper of two layers. Trotter 1975b: 79–80.
P28/21 Wairau Bar	NZ1835	700 ± 142	1027–1483	Human bone, burial 42. Trotter 1975b: 80.
P28/21 Wairau Bar	NZ1837	1029 ± 41	1269–1413	*Paphies australe*. Trotter 1975b: 80.
P28/21 Wairau Bar	NZ1838	547 ± 58	1296–1464	*Euryapteryx gravis* collagen. Trotter 1975b: 80.
P28/21 Wairau Bar	NZ4442	575 ± 45	1299–1367 (42%) 1374–1438 (53%)	Human bone, burial 3.
P28/21 Wairau Bar	NZ4443	598 ± 56	1289–1430	Human bone, burial 5.
P28/21 Wairau Bar	NZ4444	329 ± 46	1467–1664	Human bone, burial 35.
P30/4 Clarence	NZ1836	1065 ± 41	1232–1396	*Lunella smaragda*. McCulloch and Trotter 1975: 17; Trotter and McCulloch 1979: 2–6; Trotter 1982: 90,92.

P30/5 Clarence	NZ3113	382 ± 59	1444–1646	Charcoal, *Coprosma* sp. *Podocarpus spicatus* top of plaggen soil beneath a stone row. McFadgen 1980: 16.
P30/5 Clarence	NZ4500	511 ± 30	1690–1904 (90%) 1928–1950 (5%)	*Haliotis iris*. Trotter and McCulloch 1979: 9–14; Trotter 1982: 99.
P30/5 Clarence	NZ4501	586 ± 28	1637–1822	*Mytilus* and *Perna* sp. Trotter and McCulloch 1979: 9–14; Trotter 1982: 99.
P30/6 Clarence	NZ3397	430 ± 40	1428–1526 (74%) 1561–1632 (22%)	Charcoal, *Pseudopanax* sp., tree root in position of growth in buried soil formed in bottom of borrow pit. McFadgen 1980: 16.
O31/5 Takahanga	NZ4464	646 ± 83	1261–1438	Human bone, burial No.4. Trotter 1974b.
O31/5 Takahanga	NZ4465	171 ± 81	1647–1955	Burnt human bone, cremation K52. Trotter 1974b.
O31/5 Takahanga	NZ4526	419 ± 45	1433–1634	Human bone, burial No. 1. Trotter 1974b; 1982: 100.
O31/5 Takahanga	NZ4635	477 ± 56	1328–1334 (1%) 1395–1527 (83%) 1559–1632 (12%)	Human bone, burial No.4. Trotter 1974b. Repeat of NZ4464.
O31/30 Avoca	NZ2716	840 ± 60	1045–1100 (11%) 1115–1281 (84%)	*Leptospermum* and *Coprosma* charcoal, squares 9–10. Trotter 1980: 283.
O31/30 Avoca	NZ2717	463 ± 156	1268–1955	Bone (? moa/seal; Anderson 1989: 226), squares 9–10. Trotter 1980: 283.
O31/30 Avoca	NZ2718	1183 ± 29	1115–1281	*Lunella smaragda*, squares 9–10. Trotter 1980: 283.
O31/30 Avoca	NZ2719	1174 ± 33	1118–1288	*Protothaca crassicosta*, squares 9–10. Trotter 1980: 283.
O31/30 Avoca	NZ2720	498 ± 41	1398–1485	Palaeosol (matrix) otherwise unidentified, squares 9–10. Trotter 1980: 283.

O31/30 Avoca	NZ3164	952 ± 192	719–1396	*Anomalopteryx didiformis* collagen, squares 9–10. Trotter 1980: 283.
O31/30 Avoca	NZ3827	6787 ± 100	5870–5474BC	Unidentified charcoal.
O31/30 Avoca	NZ4155	703 ± 85	1199–1426	*Anomalopteryx didiformis* collagen, duplicate of NZ3164, squares 9–10. Trotter 1980: 283–284.
O31/30 Avoca	NZ6472	871 ± 40	1367–1517	*Haliotis iris*, dates formation of beach ridge C. NZ6307, NZ6744, NZ6765 and NZ6779 date earlier geological events. McFadgen 1987: 385.
O31/30 Avoca	NZ6496	529 ± 42	1317–1348 (8%) 1388–1465 (87%)	*Anomalopteryx didiformis* collagen, base of wall. Anderson 1989: 222; McCulloch 1982: 2.
O31/30 Avoca	NZ6525	800 ± 32	1432–1583	*Cookia sulcata*, outside wall. Anderson 1989: 223; McCulloch 1982: 2.
O31/30 Avoca	NZ6566	745 ± 59	1204–1396	*Anomalopteryx didiformis* collagen, outside wall. Anderson 1989: 222; McCulloch 1982: 2.
O31/15 Peketa	NZ4152	599 ± 40	1569–1828	*Haliotis iris*. Trotter 1982: 98; Brailsford 1981: 131–133.
O31/15 Peketa	NZ4153	682 ± 40	1508–1683	*Haliotis iris*. Trotter 1982: 98; Brailsford 1981: 131–133.
O31/15 Peketa	NZ4154	508 ± 83	1293–1527 (83%) 1559–1632 (12%)	Dog bone. Trotter 1982: 98; Brailsford 1981: 131–133.
O31/15 Peketa	NZ4296	419 ± 45	1433–1634	Dog bone, floor of pit house. Trotter 1982: 98; Brailsford 1981: 131–133. Repeat of NZ4154.
O31/32 Peketa	NZ4502	573 ± 45	1617–1888 (94%) 1943–1950 (1%)	*Cellana* sp., from midden fill at base of defensive wall of *pā*. Brailsford 1981: 132, 135.

O32/20				
Pari Whakatau	NZ133	343 ± 40	1478–1650	Unidentified wood of wall post No. 21, pit C. Duff 1961: 270.
O32/31				
Lagoon Flat	NZ1834	437 ± 57	1419–1530 (64%)	
			1551–1634 (28%)	Human bone. Trotter 1982: 97; McCulloch and Trotter 1975: 17.

Note: Conventional ages may differ from previously published figures, and are derived from the current records of the Nuclear Sciences Group, Physical Sciences Division, New Zealand Department of Scientific and Industrial Research, whose co-operation is acknowledged. In the past, inconsistencies in nomenclature and the reporting of calibration standards have led to some confusion about the interpretation of radiocarbon dates measured at the DSIR Radiocarbon Laboratory. To resolve such questions and ensure that all radiocarbon ages are reported in a consistent manner, measurements made prior to 1988 have been recalculated by the Radiocarbon Laboratory in accordance with the recommendations of Stuiver and Polach (1977) and stored on a database. From 1988, all results since NZ 7543 have been reported by the laboratory in strict accordance with the Stuiver and Polach conventions. The 95% confidence intervals are calibrated ages according to the computer program by Stuiver and Reimer (1986), run by McFadgen. For other aspects see McFadgen 1982. Comments are derived from published references and the correspondence files of Nuclear Sciences Group.

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